

OPERATING AND SERVICE MANUAL

**MODEL 18135A (RS232C/V.24)
AND
MODEL 18139A (MIL-188C)
INTERFACE PODS**



**HEWLETT
PACKARD**

SAFETY

This product has been designed and tested according to International Safety Requirements. To ensure safe operation and to keep the product safe, the information, cautions, and warnings in this manual must be heeded. Refer to Section I for general safety considerations applicable to this product.

CERTIFICATION

Hewlett-Packard Company certifies that this product met its published specifications at the time of shipment from the factory. Hewlett-Packard further certifies that its calibration measurements are traceable to the United States National Bureau of Standards, to the extent allowed by the Bureau's calibration facility, and to the calibration facilities of other International Standards Organization members.

WARRANTY

This Hewlett-Packard product is warranted against defects in material and workmanship for a period of one year from date of shipment, except that in the case of certain components listed in Section I of this manual, the warranty shall be for the specified period. During the warranty period, Hewlett-Packard Company will, at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges to return the product to Buyer. However, Buyer shall pay all shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

LIMITATION OF WARRANTY

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by Buyer, Buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance.

NO OTHER WARRANTY IS EXPRESSED OR IMPLIED. HP SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

EXCLUSIVE REMEDIES

THE REMEDIES PROVIDED HEREIN ARE BUYER'S SOLE AND EXCLUSIVE REMEDIES. HP SHALL NOT BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, WHETHER BASED ON CONTRACT, TORT, OR ANY OTHER LEGAL THEORY.

ASSISTANCE

Product maintenance agreements and other customer assistance agreements are available for Hewlett-Packard products.

For any assistance, contact your nearest Hewlett-Packard Sales and Service Office. Addresses are provided at the back of this manual.



OPERATING AND SERVICE MANUAL

18135A RS-232C/V.24 INTERFACE POD AND 18139A MIL-188C INTERFACE POD

SERIAL NUMBERS

This manual applies directly to instruments with serial numbers prefixed **2316A** (HP 18135A RS-232C-V.24) and **2316A** (HP 18139A MIL-188C).

For additional important information about serial numbers see **INSTRUMENTS COVERED BY MANUAL** in Section I.

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MANUAL PART NO: 18135-90001
Microfiche Part No: 18135-90002

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WARNING**SAFETY**

If this instrument is to be energized via an autotransformer for voltage reduction, make sure the common terminal is connected to the earthed pole of the power source.

BEFORE SWITCHING ON THIS INSTRUMENT, the protective earth terminals of this instrument must be connected to the protective conductor of the (mains) power cord. The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by use of an extension cord (power cable) without a protective conductor (grounding).

Make sure that only fuses with the required rated current and of the specified type (normal blow, time delay, etc.) are used for replacement. The use of repaired fuses and the short-circuiting of fuse holders must be avoided.

Whenever it is likely that the protection offered by fuses has been impaired, the instrument must be made inoperative and be secured against any unintended operation.

GROUNDING

Any interruption of the protective (grounding) conductor (inside or outside the instrument) or disconnecting the protective earth terminal can make this instrument dangerous. Intentional interruption is prohibited.

HIGH VOLTAGE

Any adjustment, maintenance, and repair of the opened instrument under voltage should be avoided as much as possible and, when inevitable, should be carried out only by a skilled person who is aware of the hazard involved.

Capacitors inside the instrument may still be charged even if the instrument has been disconnected from its source of supply.

Adjustments and service described herein are performed with power supplied to the instrument while protective covers are removed. Energy available at many points, if contacted, result in personal injury.

CAUTION**LINE VOLTAGE**

BEFORE SWITCHING ON THIS INSTRUMENT, make sure instrument requirements match the voltage of the power source.

GROUNDING

BEFORE SWITCHING ON THIS INSTRUMENT, ensure that all devices connected to this instrument are connected to the protective (earth) ground.

BEFORE SWITCHING ON THIS INSTRUMENT, ensure that the line power (mains) plug is connected to a three-conductor line power outlet that has a protective (earth) ground. (Grounding one conductor of a two-conductor outlet is not sufficient.)

IEC SYMBOLS

The following is a list of key IEC symbols used by Hewlett-Packard. All symbols are normally applied adjacent to the device requiring the symbol. They shall not be placed on removable parts likely to be detached or lost.



Instruction Manual symbol: If necessary, to preserve the apparatus from damage it is necessary for the user to refer to the instruction manual, then shall the apparatus be marked with this symbol (IEC 348;16a).



Terminal devices fed from the interior by live voltages that may be dangerous when connecting to or disconnecting from those devices shall be marked with the flash shown when the voltage exceeds 1 KV: The flash shall be red (IEC 348;18c).



Earth Terminals. If the use of this symbol for the protective earth terminal is not permitted by National Standards, it may be modified, for example, by being placed inside a circle (IEC 348;18a).



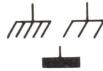
AC current (IEC 117-1, symbol No. 3).



DC current (IEC 117-1, symbol No. 2).



AC or DC current (IEC 117-1, symbol No. 8).



Frame or chassis connection. The hatching may be completely or partly omitted if there is no ambiguity. If the hatching is omitted, the line representing the frame or chassis shall be thicker (IEC 117-1, symbol No. 87).

A

Ampere (IEC 117-4, symbol No. 356).

V

Volt (IEC 117-4, symbol No. 357).

VA

Voltampere (IEC 117-4, symbol No. 358).

W

Watt (IEC 117-4, symbol No. 360).

Wh

Watthour (IEC 117-4, symbol No. 361).

VAh

Voltamperehour (IEC 117-4, symbol No. 362).

Hz

Hertz (IEC 117-4, symbol No. 365).



Contactor, normally closed. In order to avoid confusion with the symbol for a capacitor, the distance between the horizontal (as drawn here) lines should be at least equal to the length of those lines (IEC 117-3, symbol No. 215.2).

In addition the following describes the use of Warnings, Cautions and Notes used in HP Automatic Test System Manuals.

Warnings, cautions and notes. (All) Warnings and cautions shall precede the text to which each applies but notes may precede or follow applicable text depending on the material to be highlighted. Warnings, cautions, and notes shall not contain procedural steps nor shall they be numbered. When a warning, caution, or note consists of two or more paragraphs, the heading WARNING, CAUTION, NOTE, shall not be repeated above each paragraph. If it is ever necessary to precede a paragraph by both a warning and a note, or a caution and a note, etc, they shall appear in the sequence as noted, namely, warnings, cautions, notes. Such inserts in the text shall be short and concise and be used to emphasize important and critical instructions.

WARNING

An operating procedure, practice, etc. which, if not correctly followed, could result in personal injury or loss of life.

CAUTION

An operating procedure, practice, etc. which, if not strictly observed, could result in damage to, or destruction of, equipment.

NOTE: An operating procedure, condition, etc. which is essential to highlight.

Health hazards precaution data. (All) When hazardous chemicals or adverse health factors, in the environment or use of the equipment cannot be eliminated, appropriate precautionary requirements shall be included.

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**Figure 1-1. RS-232C/V.24 Interface Pod
(Model 18139A MIL-188C Interface Pod Not shown)**

SECTION I GENERAL INFORMATION

1-1. INTRODUCTION

This Operating and Service Manual contains information required to install, operate, and service the Hewlett-Packard Models 18135A RS-232C/V.24 and 18139A MIL-188C Interface Pods. The 18135A Interface Pod is shown in Figure 1-1.

This manual is divided into eight major sections which provide the following information:

SECTION I, GENERAL INFORMATION, provides specifications, safety considerations, accessory identification, and a brief description of the accessories.

SECTION II, INSTALLATION, provides information for initial inspection, preparation for use, power requirements, operating environment, and storage and shipment.

SECTION III, OPERATION, provides cable description, instructions to connect the Interface Pod to the 4955A and the network under test, and a brief description of RS-232C/V.24 and MIL-188C standards.

SECTION IV, PERFORMANCE TESTS, are performed after the HP 4955A is connected to the Interface Pod, the Performance Tests are located in the HP 4955A Protocol Analyzer Service Manual (HP 04955-90004).

SECTION V, ADJUSTMENTS, there are no adjustments for HP 18135A RS-232C/V.24 or HP 18139A MIL-188C Interface Pods.

SECTION VI, REPLACEABLE PARTS, provides information required to order all replaceable parts and assemblies.

SECTION VII, MANUAL BACKDATING CHANGES, contains information to backdate the manual for earlier accessories and to maintain compatibility with the HP 4955A Protocol Analyzer.

SECTION VIII, SERVICE, provides service and troubleshooting information. This includes theory of operation, block diagrams, component locators, and schematics.

1-2. SPECIFICATIONS

HP 18135A RS-232C/V.24 Interface Pod specifications are listed in Table 1-1. Table 1-2 lists specifications for HP 18139A MIL-188C. These specifications are the performance standards or limits against which the accessory can be tested.

1-3. SAFETY CONSIDERATIONS

Whenever internal circuits are exposed, caution must be exercised. Observe all warnings and cautions marked on the accessory or listed in procedures.

Table 1-1. Model 18135A RS-232C/V.24 Specifications

ELECTRICAL:	
Active Input voltage:	+3 to +25 = Binary 0 -3 to -25 = Binary 1 ±25 VDC
Max. Input Voltage:	>10 kohms
Input Impedance:	-12 to -5 = Binary 1
Active Output Voltage:	+5 to +12 = Binary 0
PHYSICAL:	
Dimensions: (Interface Pod)	20.3 cm x 12.4 cm x 3.6 cm (8 in x 4.9 in x 1.4 in)
Weight including cable:	794 gr (28 oz)
Interface Pod Y-Cable	
Length:	46 cm (18 in)
OPERATING	
Temperature	0°C to +55°C (32°F to 131°F)
Altitude	Up to 4600 metres (15,000 ft)
STORAGE	
Temperature	-40°C to +75°C (-40°F to 167°F)
Altitude	Up to 15,300 metres (50,000 ft)

Table 1-2. Model 18139A MIL-188C Specifications

ELECTRICAL:	
Active Input voltage:	+0.5 to +6 = Binary 1 -0.5 to -6 = Binary 0
Max. Input Voltage:	±25 VDC
Input Impedance:	>10 kohms
Active Output Voltage:	-6 to -4 = Binary 1 +4 to +6 = Binary 0
PHYSICAL:	
Dimensions: (Interface Pod)	20.3 cm x 12.4 cm x 3.6 cm (8 in x 4.9 in x 1.4 in)
Weight including cable:	794 gr (28 oz)
Interface Pod Y-Cable	
Length:	46 cm (18 in.)
OPERATING	
Temperature	0°C to +55°C (32°F to 131°F)
Altitude	Up to 4600 metres (15,000 ft)
STORAGE	
Temperature	-40°C to +75°C (-40°F to 167°F)
Altitude	Up to 15,300 metres (50,000 ft)

1-4. INSTRUMENTS COVERED BY MANUAL

This accessory has a two part serial number. The serial number is in the form 0000A00000. The first four digits and the letter comprise the serial number prefix. The last five digits form the sequential suffix unique to each accessory. The content of this manual applies directly to accessories with the same or lower serial number prefix as listed under SERIAL PREFIXES on the title page.

An accessory manufactured after the printing of this manual may have a serial prefix higher than listed on the Title Page of this manual. This indicates that the Interface Pod has been modified, a yellow Manual Change Sheet will accompany the manual to provide information to adapt the manual to the newer accessory.

1-5. DESCRIPTION

The HP 18135A RS-232C/V.24 and HP 18139A MIL-188C Interface Pods provide the connection between the HP 4955A Protocol Analyzer and the Data Terminal Equipment (DTE) and/or Data Circuit-Terminating Equipment (DCE). The HP 18135A follows CCITT V.24 and EIA RS-232C electrical, mechanical, functional, and procedural specifications. The HP 18139A meets Military Standard 188-C.

Figure 1-2 illustrates typical placement of the Interface Pod during monitor mode in a network. The 4955A operates in two modes, as a passive monitor of all data and control signals on a digital link or as a simulator, driving data and control signals to exercise the network or specific components.

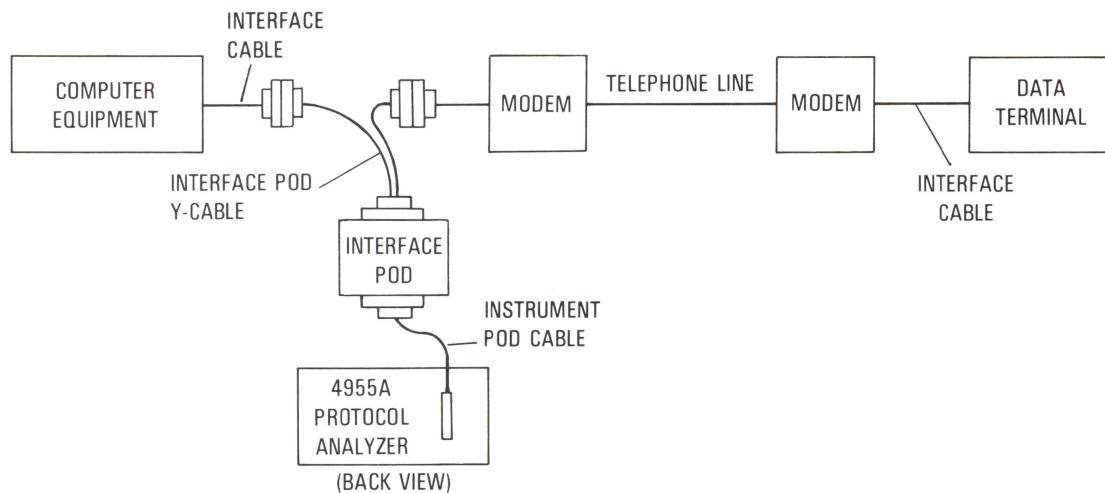


Figure 1-2. Interface Pod in Typical Monitor Mode Setup

1-6. RELATED MANUALS

Operating information for the Protocol Analyzer is located in the 4955A Operating Manual (HP 04955-90015). Service information including Interface Pod Performance Tests is located in the 4955A Service Manual (HP 04955-90004).

1-7. USER REPAIR

Internal repairs to the instrument should be performed by authorized Service Centers only. For assistance, contact the nearest Hewlett-Packard Sales and Service Office, listed at the rear of this manual.

1-8. WARRANTY

Instrument warranty is as listed on the inside of the front cover.

SECTION II

INSTALLATION

2-1. INTRODUCTION

This section contains information for initial inspection, preparation for use, power requirements, storage, and shipment of the HP 18135A RS-232C/V.24 and HP 18139A MIL-188C Interface Pods.

2-2. INITIAL INSPECTION

Inspect the shipping container for damage. If the container or cushioning material is damaged, keep it. Check the contents of the shipping container for completeness, then check the unit for any physical damage. Refer to the 4955A Service Manual (HP 04955-90004) for Performance Tests.

If the unit is physically damaged or fails the Performance Tests, notify the carrier and the nearest Hewlett-Packard office listed at the rear of this manual. Hewlett-Packard will arrange for repair or replacement of the Interface Pod without waiting for claim settlement.

2-3. PREPARATION FOR USE

2-4. POWER REQUIREMENTS

The Interface Pod requires no external power source. ± 5 V and ± 12 V are supplied by the HP 4955A Protocol Analyzer through Instrument Pod Cable W14.



When attaching cables to the Interface Pod always fasten the slide locks to prevent damaging the cables and to assure a good electrical connection.

2-5. CABLES

The Interface Pod comes with one input/output interface, the Interface Pod Y-cable. It connects the Interface Pod to the network under test. Tables 8-1 and 8-2 give a complete description of the cables and pinouts.

2-6. OPERATING ENVIRONMENT

The Interface Pod should be protected from temperature extremes which can cause condensation in the accessory. It may be operated and stored in environments within the following limits:

OPERATING

Temperature0°C to +55°C (32°F to 131°F)
Altitude	Up to 4600 metres (15,000 ft)

STORAGE

Temperature	-40°C to +75°C (-40°F to 167°F)
Altitude	Up to 15,300 metres (50,000 ft)

2-7. STORAGE AND SHIPMENT

2-8. TAGGING FOR SERVICE

If the accessory is returned to Hewlett-Packard for service, complete one of the blue repair tags located at the end of this manual and attach it to the accessory.

2-9. Original Packaging. Containers and packing material identical to those used in factory packaging are available through Hewlett-Packard sales offices. When returning an accessory to Hewlett-Packard for service, complete and attach the blue repair tag. Mark the container FRAGILE to ensure careful handling. In any correspondence, refer to the accessory by model number and serial number.

2-10. Other Packaging. Use these general instructions for packaging with commercially available materials:

1. Wrap the accessory in heavy paper or plastic. If shipping to a Hewlett-Packard Sales or Service Office, include a completed blue repair tag.
2. Use a strong shipping container, such as a double-wall carton with 275 lbs burst test.
3. Use a layer of shock absorbing material, 70-100 mm (3-4 in.) thick. This provides a firm cushion and prevents movement inside the container.
4. Seal the carton securely and mark it FRAGILE to ensure careful handling.

SECTION III

OPERATION

3-1. INTRODUCTION

This section describes connection of the HP 18135A RS-232C/V.24 and HP 18139A MIL-188C Interface Pods to the HP 4955A Protocol Analyzer and the network under test. A brief description of each standard is given. Refer to the 4955A Operating Manual (HP 04955-90015) for specific Protocol Analyzer operating instructions and test routines.

3-2. SELF CHECK

A 4955A self check routine is automatically performed at power up by the Protocol Analyzer. Interface Pod tests can be performed by selecting the desired test from the 4955A menu. Refer to the 4955A Operating Manual for complete instructions.

3-3. CABLES

Each Interface Pod is connected to two input/output cables. The Instrument Pod cable (W1) connects the Interface Pod to the Protocol Analyzer. The 50 pin connector on this cable is compatible with both the 18135A and 18139A. The other cable is the Interface Pod Y-cable (W2) and connects the Interface Pod to the network under test.

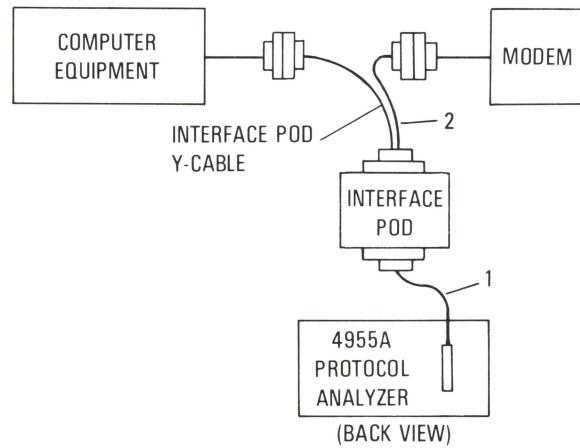


Figure 3-1. Cables

1. W1, the Instrument Pod Cable which is supplied with the 4955A connects the Protocol Analyzer to the Interface Pod.
2. Interface Pod Y-cable W2 connects the Interface Pod to the network under test.

3-4. OPERATOR CHECKS

Operation verification is performed with the Interface Pod connected to the HP 4955A Protocol Analyzer, but not to the network under test. Refer to the 4955A Operating Manual (04955-90015), Section III for combined Protocol Analyzer and Interface Pod Operator Checks.

3-5. OPERATING INSTRUCTIONS

CAUTION

Turn off the 4955A Protocol Analyzer before disconnecting or connecting any Interface Pod.

3-6. SETUP

1. Connect cable W1 from the Protocol Analyzer to the Interface Pod and W2 from the Interface Pod to the network under test. The cable connectors are keyed to prevent backwards connections. Figures 3-2 and 3-3 illustrate typical simulate and monitor mode connections.

CAUTION

When attaching cables to the Interface Pod always fasten the slide locks to prevent damaging the cables and to assure a good electrical connection.

2. Once cables are connected to the Interface Pod, it effectively becomes a part of the Protocol Analyzer. Operating instructions are given in Section III of the Operating Manual (HP 04955-90015).

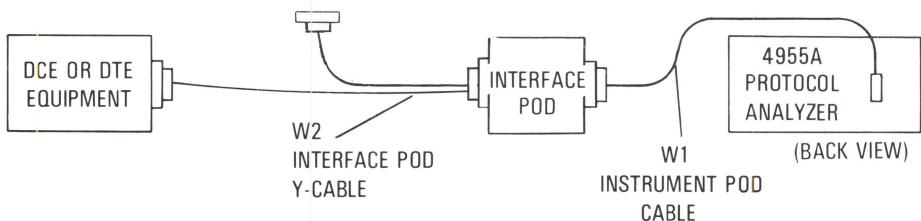


Figure 3-2. Simulate Mode Operation

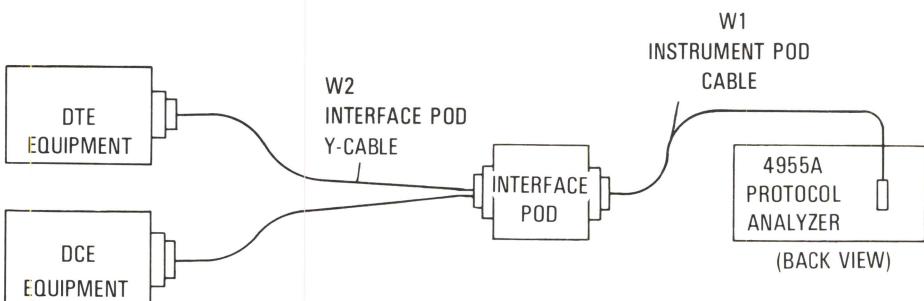


Figure 3-3. Monitor Mode Operation

3-7. PROTOCOL DESCRIPTION

V.24 is a CCITT international standard defining functional interchange circuits. RS-232C is an accepted standard in the United States for data communication interfaces.

3-8. RS-232C

RS-232C is an Electronic Industry Association (EIA) Recommended Standard. The standard describes the mechanical, electrical, functional, and procedural characteristics to establish, maintain, and disconnect the interface between the DTE and DCE.

3-9. V.24

The HP 18135A follows V.24, V.28, and ISO 2110 standards. These standards are collectively referred to in this manual as V.24. ISO 2110 describes the mechanical properties, V.28 the electrical characteristics, and V.24 the functional interchange circuits and procedures governing their interrelationships.

3-10. MIL-188C

MIL-188C follows the EIA RS-232C functional, mechanical, and procedural standards. The electrical thresholds are different and the polarity of signals TXD, RXD, STXD, and SRXD are inverted.

SECTION IV

PERFORMANCE TESTS

4-1. INTRODUCTION

All tests to verify instrument specifications must be performed with the 18135A or 18139A Interface Pod connected to the 4955A Protocol Analyzer. Refer to Section IV of the 4955A Service Manual (HP 04955-90004).

SECTION V ADJUSTMENTS

There are no adjustments for the HP 18135A RS-232C/V.24 or HP 18139A MIL-188C Interface Pods.

SECTION VI

REPLACEABLE PARTS

6-1. INTRODUCTION

This section contains information for ordering replacement parts. Table 6-1 lists reference designators and abbreviations used, Table 6-2 is a Manufacturers' Code List. Table 6-3 is a Replaceable Parts list. Mechanically the Interface Pod cases and cables are the same. Figure 6-1 is an exploded view of both accessories.

6-2. REPLACEABLE PARTS LIST

Table 6-3 is the list of replaceable parts for the 18135A RS-232C/V.24 with the parts given in alphanumerical order. Table 6-4 lists 18139A Mil-188C replaceable parts. Included is the Reference Designator, HP Part Number, Check Digit, Quantity (total used in accessory), Description, and Manufacturers' Code and Part Number. Chassis and mechanical parts are listed in Figure 6-1.

6-3. ORDERING INFORMATION

To order a listed part, quote the HP Part Number and quantity needed. Address the order to the nearest Hewlett-Packard office. When ordering a part not listed in the manual, include the accessory model number, serial number, and a physical and functional description of the part. Address the order to the nearest Hewlett-Packard office.

Table 6-1. Reference Designators and Abbreviations

REFERENCE DESIGNATIONS	
A	= assembly
B	= fan; motor
BT	= battery
C	= capacitor
CR	= diode; diode thyristor; varactor
DL	= delay line
DS	= annunciator; lamp; LED
E	= misc electrical part
F	= fuse
FL	= filter
H	= hardware
J	= electrical connector (stationary portion); jack
L	= coil; inductor
MP	= misc. mechanical part
P	= electrical connector (movable portion); plug
Q	= transistor; SCR; triode thyristor
R	= resistor
RT	= thermistor
S	= switch; jumper
T	= transformer
TB	= terminal board
TP	= test point
U	= integrated circuit; microcircuit
V	= electron tube; glow lamp
VR	= voltage regulator; breakdown diode
W	= cable
X	= socket
Y	= crystal unit (piezo- electric or quartz)

Table 6-1. Reference Designations and Abbreviations (Cont.)

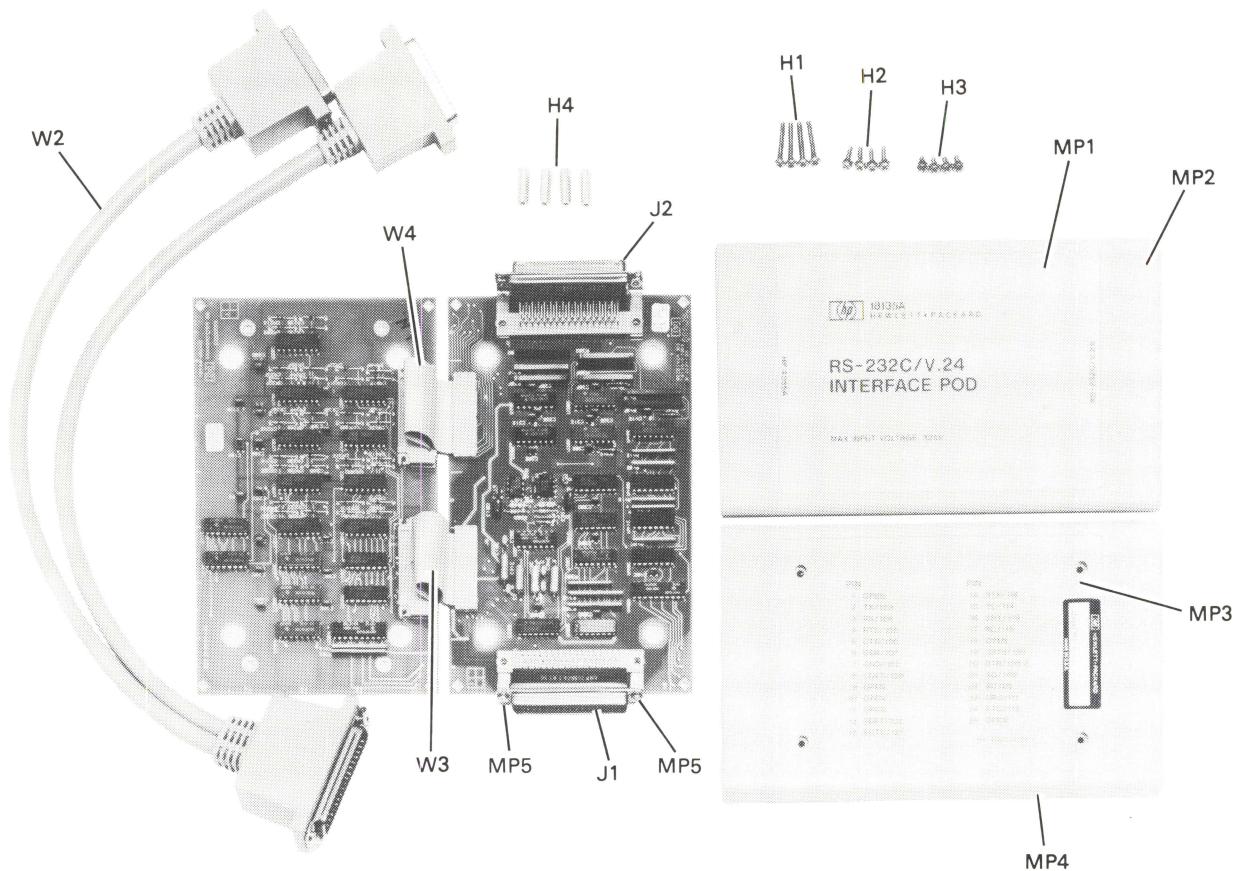
ABBREVIATIONS			
A = amperes	F = female, farads	N.O. = normally open	
AC = alternating current	FF = flip-flop	NP = No Polarity	
ADD = address	FLM = film	NPN = negative-positive-negative	
ADJ = adjust, adjustment	FRNT = front	NPO = negative-positive zero (zero	
AL = aluminum	FXD = fixed	temperature coefficient)	
AR = as required	G = giga (10 ⁹)	NRFR = not recommended for	
ASM = algorithmic state machine	GE = germanium	field replacement	
ASSY = assembly	GL = glass	NS = normally shorting,	
B = base	GND = ground(ed)	nanosecond	
BCD = binary coded decimal	GP = General Purpose	NSR = not separately replaceable	
BeCu = beryllium copper	GRA = gray	NYL = nylon	
BIN = binary	GRN = green	OBD = order by description	
BLK = black	H = henries	OD = outside diameter	
BLU = blue	HDW = hardware	ORN = orange	
BP = band pass	HEX = hexagon, hexagonal, six	P = pico (10 ⁻¹²)	
BRN = brown	HP = high pass	PC = printed circuit	
BRS = brass	HR = hour(s)	PCA = printed-circuit assembly	
BTU = British thermal unit	HZ = Hertz	PF = picofarad	
C = collector	IC = integrated circuit	PIV = Peak Inverse Voltage	
CATH = cathode	ID = inside diameter	PK = peak	
CCW = counterclockwise	IF = intermediate frequency	PNL = panel	
CD PL = cadmium plate	IN. = inch, inches	PNP = positive-negative-positive	
CER = ceramic	INCAND = incandescent	P-P = peak-to-peak	
CERMET = ceramic met flm	INCL = include(s)	PPM = parts per million	
CKTS = circuits	INSUL = insulation, insulated	POLYC = polycarbonate	
C FLM = carbon film	INT = internal	POLYE = polyethylene	
CLK = clock	INTL = internal	POLYSTY = polystyrene	
CLR = clear	K = kilo (10 ³), kilohm	PORC = porcelain	
CMOS = complementary metal	LED = light emitting diode	POSN = position(s)	
oxide semiconductor logic	LFT = left	POZI = pozidrive	
COM = common	LG = long	PRV = peak reverse voltage	
COML = commercial	LH = lefthand	PWV = peak working voltage	
COMP = composition	LKWR = lockwasher	P/O = part of	
COMPL = complete	LP = low pass	R = ring	
COND = conductor	LS = low power Schottky	RAM = random access memory	
CONN = connector	LSB = least significant bit	ROM = read only memory	
CONT = contact	M = milli (10 ⁻³), male,	RECT = rectifier	
CPRSN = compression	MET FLM = metal film	RF = radio frequency	
CTL = complementary-	MET OX. = metal oxide	RH = right hand	
transistor logic	MHZ = megahertz	RMS = root-mean-square	
CW = clockwise	MFR = manufacturer	RND = round	
D = diameter	MINTR = miniature	RT = right hand	
DC = direct current	MISC = miscellaneous	RTL = resistor-transistor logic	
DEPC = deposited carbon	MOM = momentary	RTNT = retainer	
DIA = diameter	MOS = metal oxide semiconductor	RTRY = rotary	
DIP = dual in-line package	MSB = most significant bit	RVT = rivet	
DPDT = double-pole, double-throw	MTCHD = matched	RWV = reverse working voltage	
DPST = double-pole, single-throw	MTG = mounting	S = second	
DR = drive	MTLC = metallic	SB = slow blow	
DRV = driver	N = nano (10 ⁻⁹)	SCR = silicon controlled rectifier	
DSPL = display	N.C. = normally closed, no	SE = selenium	
DTL = diode-transistor logic	connection	SGL = single	
E = emitter	NE = neon	SI = silicon	
ECL = emitter-coupled logic	NO. = number	SHK = shank	
ELECT = electrolytic		SIP = single in-line package	
ENCAP = encapsulated		SKT = socket	
EXT = external		SLDR = solder	
EXTR = extractor		SPCG = spacing	

Table 6-1. Reference Designators and Abbreviations (Cont.)

ABBREVIATIONS			
SPDT	= single-pole, double-throw	TOL	= tolerance
SPST	= single-pole, single-throw	TRMR	= trimmer
SST	= stainless-steel	TRN	= turn
STL	= steel	TTL	= transistor-transistor logic
SZ	= size	TYP	= typical
T	= tip	U (μ)	= micro (10^{-6})
TA	= tantalum	UF	= microfarad
TEL	= telephone	US	= microseconds
T.C.	= Temp. Compensated, temp. coefficient	V	= volt(s)
THKNS	= thickness	VAR	= variable
TI	= titanium	VCO	= voltage controlled oscillator
TGL	= toggle	VDCW	= direct current working volts
THD	= thread	VIO	= violet
THK	= thick	VNP	= no polarity voltage
			W = watts
			WT = weight
			WW = wirewound
			WHT = white
			WIP = wiper
			WIV = working inverse voltage
			WSHR = washer
			X = times, multiple
			YEL = yellow
			ZNR = zener
			ϕ = phi, phase

Table 6-2. Manufacturers Code List

MFR NO.	MANUFACTURER NAME	ADDRESS		ZIP CODE
S0545 00000	NIPPON ELECTRIC CO ANY SATISFACTORY SUPPLIER	TOKYO	JP	
01121	ALLEN-BRADLEY CO	MILWAUKEE	WI	53204
01295	TEXAS INSTR INC SEMICOND CMPNT DIV	DALLAS	TX	75222
24546	CORNING GLASS WORKS (BRADFORD)	BRADFORD	PA	16701
27014	NATIONAL SEMICONDUCTOR CORP	SANTA CLARA	CA	95051
28480	HEWLETT-PACKARD CO CORPORATE HQ	PALO ALTO	CA	94304
3L585	RCA CORP SOLID STATE DIV	SOMERVILLE	NJ	
34335	ADVANCED MICRO DEVICES INC	SUNNYVALE	CA	94086
52063	EXAR INTEGRATED SYSTEMS INC	SUNNYVALE	CA	94086
56289	SPRAGUE ELECTRIC CO	NORTH ADAMS	MA	01247



ITEM	HP PART NUMBER	QTY	DESCRIPTION	MFR CODE	MFR PART NUMBER
MP1	7121-3025	1	TOP COVER LABEL	28480	7121-3025
MP2	5060-7162	1	TOP COVER	28480	5040-7162
MP3	7121-3035	1	BOTTOM COVER LABEL	28480	7121-3035
MP4	5040-4474	1	BOTTOM COVER	28480	5040-4474
MP5	1251-0218	4	CONNECTOR WITH LOCKPOST	28480	1251-0218
W2	8120-3597	1	RS-232C Y-CABLE	28480	8120-3597
W3	5060-7161	1	INTERCONNECT CABLE	28480	5060-7161
W4	5060-7161	1	INTERCONNECT CABLE	28480	5060-7161
J1	1251-8137	1	50 COND D SUBMIN P	28480	1251-8137
J2	1251-7571	1	50 COND D SUBMIN S	28480	1251-7571
H1	2200-0103	4	SCREW, MACH 4-40 .25 IN	00000	ORDER BY DESCRIPTION
H2	2200-0107	4	SCREW, MACH 4-40 .375 IN	00000	ORDER BY DESCRIPTION
H3	2200-0117	4	SCREW, MACH 4-40 .875 IN	00000	ORDER BY DESCRIPTION
H4	0380-1212	4	SPACER 4-40 .625	00000	ORDER BY DESCRIPTION
USED ON MODEL 18139A (MIL-188C) ONLY					
MP1	7121-3886	1	TOP COVER LABEL	28480	7121-3886
MP3	7121-3887	1	BOTTOM COVER LABEL	28480	7121-3887

Figure 6-1. Exploded View 18135A Interface Pod

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1	18135-60001	2	1	RECEIVER BOARD (RS-232C)	28480	18135-60001
A1	18139-60001	6		RECEIVER BOARD (MIL-188C)	28480	18139-60001
A1C10C	0180-0374	3	4	CAPACITOR-FXD .1UF +/-10% 20VDC TA	56289	150D106X9020B2
A1C10D	0160-3508	9	2	CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-3508
A1C11D	0160-0576	5	37	CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C20B	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C20C	0160-3879	7	4	CAPACITOR-FXD .1UF +/-20% 100VDC CER	28480	0160-3879
A1C20D	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C20E	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C20F	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C21B	0160-3879	7		CAPACITOR-FXD .01UF +/-20% 100VDC CER	28480	0160-3879
A1C21C	0180-0374	3		CAPACITOR-FXD .1UF +/-10% 20VDC TA	56289	150D106X9020B2
A1C21D	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C21E	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C22B	0160-3879	7		CAPACITOR-FXD .01UF +/-20% 100VDC CER	28480	0160-3879
A1C22C	0180-0374	3		CAPACITOR-FXD .1UF +/-10% 20VDC TA	56289	150D106X9020B2
A1C22E	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C23C	0160-3879	7		CAPACITOR-FXD .01UF +/-20% 100VDC CER	28480	0160-3879
A1C24C	0180-0374	3		CAPACITOR-FXD .1UF +/-10% 20VDC TA	56289	150D106X9020B2
A1C31B	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C30E	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C31F	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C31D	0160-3508	9		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-3508
A1C31E	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C32D	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C32E	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C40C	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1C40D	0160-4810	8	7	CAPACITOR-FXD 330PF +/-5% 100VDC	02798	CAC02COG331J100A
A1C40E	0160-4810	8		CAPACITOR-FXD 330PF +/-5% 100VDC	02798	CAC02COG331J100A
A1C41C	0160-4810	8		CAPACITOR-FXD 330PF +/-5% 100VDC	02798	CAC02COG331J100A
A1C41D	0160-4810	8		CAPACITOR-FXD 330PF +/-5% 100VDC	02798	CAC02COG331J100A
A1C42C	0160-4810	8		CAPACITOR-FXD 330PF +/-5% 100VDC	02798	CAC02COG331J100A
A1C42D	0160-4810	8		CAPACITOR-FXD 330PF +/-5% 100VDC	02798	CAC02COG331J100A
A1C43D	0160-4810	8		CAPACITOR-FXD 330PF +/-5% 100VDC	02798	CAC02COG331J100A
A1C41E	0160-0576	5		CAPACITOR-FXD .1UF +/-20% 50VDC CER	28480	0160-0576
A1J1	1251-8137	7	1	CONNECTOR-SO-COND D SUBMIN P	28480	1251-8137
A1J2	1251-7571	8	1	CONNECTOR-SO-COND D SUBMIN S	28480	1251-7571
A1J3	5060-7161	1	2	CABLE-BOARD INTERCONNECT	28480	5060-7161
A1J4	5060-7161	1		CABLE-BOARD INTERCONNECT	28480	5060-7161
A1R29D	0698-3155	1	2	RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1R20F	1810-0345	6	5	NETWORK-RES 10-SIP33.0K OHM X 5	01121	210B333
A1R21G	1810-0345	6		NETWORK-RES 10-SIP33.0K OHM X 5	01121	210B333
A1R21D	0757-0415	6	2	RESISTOR 475 1% .125W F TC=0+-100	24546	C4-1/8-T0-475R-F
A1R21F	1810-0344	5	3	NETWORK-RES 10-SIP6.0K OHM X 9	01121	210A682
A1R22D	0757-0280	3	2	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1R23D	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-T0-1001-F
A1R24D	0698-3155	1		RESISTOR 4.64K 1% .125W F TC=0+-100	24546	C4-1/8-T0-4641-F
A1R25D	0757-0415	6		RESISTOR 475 1% .125W F TC=0+-100	24546	C4-1/8-T0-475R-F
A1R30B	1810-0372	9	2	NETWORK-RES 10-SIP22.0 OHM X 9	01121	210A221
A1R30C	1810-0371	8	1	NETWORK-RES 8-SIP100.0K OHM X 7	01121	208A104
A1R30D	1810-0275	1	1	NETWORK-RES 10KX9 (18135A ONLY)	05524	CSC10A01-102G
A1R30E	1810-0406	0		NETWORK-RES 10KX4 (18135A ONLY)	02483	750-83-R10K
A1R30F	1810-0345	6		NETWORK-RES 10-STOP22.0 OHM X 5	01121	210B333
A1R30G	1810-0345	6		NETWORK-RES 10-STOP22.0 OHM X 5	01121	210B333
A1R31B	1810-0272	8	2	NETWORK-RES 10-SIP33.0K OHM X 9	01121	210A331
A1R31C	1810-0406	0		NETWORK-RES 10KX4 (18135A ONLY)	02483	750-83-R10K
A1R31F	1810-0345	6		NETWORK-RES 10-SIP33.0K OHM X 5	01121	210B333
A1R34E	0698-1065	7	3	RESISTOR 10M 5% .25W CC TC= -900/+1100	01121	CB1065
A1R40C	1810-0347	8	5	NETWORK-RES B-SIP2.2K OHM X 4	01121	208B222
A1R40D	1810-0347	8		NETWORK-RES B-SIP2.2K OHM X 4	01121	208B222
A1R40E	1810-0347	8		NETWORK-RES B-SIP2.2K OHM X 4	01121	208B222
A1R40F	1810-0344	5		NETWORK-RES 10-SIP6.0K OHM X 9	01121	210A682
A1R41D	1810-0347	8		NETWORK-RES B-SIP2.2K OHM X 4	01121	208B222
A1R41E	1810-0347	8		NETWORK-RES B-SIP2.2K OHM X 4	01121	208B222
A1R41F	1810-0344	5		NETWORK-RES 10-SIP6.0K OHM X 9	01121	210A682
A1R42E	0698-1065	7		RESISTOR 10M 5% .25W CC TC= -900/+1100	01121	CB1065
A1R42F	0683-1065	7		RESISTOR 10M 5% .25W CC TC= -900/+1100	01121	CB1065
A1U20B	1820-2749	9	2	IC DRVR TTL LS DIFF LINE QUAD	01295	AM26LS31CN
A1U20C	1820-1144	6	1	IC GATE TTL LS NOR QUAD 2-IMP	01295	SN74LS02N
A1U20D	1826-0065	0	2	IC COMPARATOR PRCN B-DIP-P PKG	50545	UPC311C
A1U20E	1826-0410	9	2	IC OP AMP LOW-BIAS-H-IMPD QUAD 14-DIP-P	01295	TL084CN
A1U20F	1826-0410	9		IC OP AMP LOW-BIAS-H-IMPD QUAD 14-DIP-P	01295	TL084CN
A1U21D	1826-0065	0		IC COMPARATOR PRCN B-DIP-P PKG	50545	UPC311C
A1U30B	1820-2749	9		IC DRVR TTL LS DIFF LINE QUAD	01295	AM26LS31CN
A1U30C	1820-1281	2	2	IC DCDR TTL LS 2-TO-4 LINE DUAL 2-IMP	01295	SN74LS139N
A1U30D	1820-3283	8	3	IC RCVR TTL LS LINE RCVR QUAD	34335	AM261S34
A1U30E	1826-0719	1	3	IC OP AMP PRGMIL QUAD 16-DIP-C PKG	52063	XR346CJ
A1U30F	1826-0719	1		IC OP AMP PRGMIL QUAD 16-DIP-C PKG	52063	XR346CJ

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A1U31C	1820-3283	0	8	IC RCVR TTL LS LINE RCVR QUAD	34335	AM261S34
A1U40B	1820-2024	3	2	IC DRVR TTL LS LINE DRVR QCTL	01295	SN74LS244N
A1U40C	1820-1315	3	3	IC MULTIPLXR 8-CHAN-ANLG 16-DIP-P PKG	3L585	CD4051EE
A1U40D	1820-1315	3	3	IC MULTIPLXR 8-CHAN-ANLG 16-DIP-P PKG	3L585	CD4051BE
A1U40E	1826-0719	1	1	IC OP AMP PRGMBL QUAD 16-DIP-C PKG	52063	XR346CJ
A1U41C	1820-1315	3		IC MULTIPLXR 8-CHAN-ANLG 16-DIP-P PKG USED ON MODEL 18139A (MIL-188C) ONLY	3L585	CD4051BE
A1C30C	0160-0576	5	1	CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A1C30D	0160-0576	5	1	CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2	18135-60002	3	1	TRANSMITTER BOARD (RS-232C)	28480	18135-60002
A2	18139-60002	8	1	TRANSMITTER BOARD (MIL-188C)	28480	18139-60002
A2C10D	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C10E	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C10F	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20B	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20C	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20D	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20E	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20F	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C20G	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C21C	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C30B	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C30C	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C30D	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C30E	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C30F	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2C31C	0160-0576	5		CAPACITOR-FXD .1UF ±20% 50VDC CER	28480	0160-0576
A2CR20D	1901-0050	3	35	DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR20E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR20F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR20G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR21D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR21E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR21F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR21G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR22D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR22E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR22F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR22G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR23D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR23E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR23F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR23G	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR24E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR24F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR25E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR25F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR30D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR30E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR30F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR31D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR31E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR31F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR32E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR32F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR40D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR40E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR40F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR41D	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR41E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR41F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR42E	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2CR42F	1901-0050	3		DIODE-SWITCHING 80V 200MA 2NS DO-35	28480	1901-0050
A2P3	1251-7335	2	2	SOCKET 26P W/LATCH	28480	1251-7335
A2P4	1251-7335	2		SOCKET 26P W/LATCH	28480	1251-7335
A2R30A	1810-0272	8		NETWORK-RES 10-SIP330.0 OHM X 9	01121	210A331
A2R31A	1810-0372	9		NETWORK-RES 10-SIP220.0 OHM X 9	01121	210A221
A2U11C	1820-1729	3	5	IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U11C	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N

See introduction to this section for ordering information
*Indicates factory selected value

Table 6-3. Replaceable Parts

Reference Designation	HP Part Number	C D	Qty	Description	Mfr Code	Mfr Part Number
A2U20A	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U20B	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U20C	1820-1729	3		IC LCH TTL LS COM CLEAR 8-BIT	01295	SN74LS259N
A2U20D	1820-2852	5	9	MONOCHIP	28480	1820-2852
A2U20E	1820-2852	5		MONOCHIP	28480	1820-2852
A2U20F	1820-2852	5		MONOCHIP	28480	1820-2852
A2U20G	1820-2852	5		MONOCHIP	28480	1820-2852
A2U21C	1820-2852	5			28480	1820-2852
A2U30A	1820-2024	3		IC DRVR TTL LS LLINE DRVR OCTL	01295	SN74LS244N
A2U30B	1820-1281	2		IC DCDR TTL LS 2-TO-4-LINE DUAL 2-INP	01295	SN74LS139N
A2U30C	1820-2203	0		IC RCVR TTL LS LINE RCVR QUAD	34335	AM26LS32PC
A2U30D	1820-2852	5		MONOCHIP	28480	1820-2852
A2U30E	1820-2852	5		MONOCHIP	28480	1820-2852
A2U30F	1820-2852	5		MONOCHIP	28480	1820-2852
A2U31C	1820-2852	5		MONOCHIP	28480	1820-2852
MISCELLANEOUS PARTS						
0380-1212	4	4		SPACER- 4-40 .625 US PARTS	00000	ORDER BY DESCRIPTION
2200-0103	2	4		SCREW-MACH 4-40 .25-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
2200-0107	6	4		SCREW-MACH 4-40 .375-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
2200-0117	8	4		SCREW-MACH 4-40 .875-IN-LG PAN-HD-POZI	00000	ORDER BY DESCRIPTION
B120-3597	0	1		CABLE- Y RS232	28480	8120-3597
5040-4474	1	1		COVER (BOTTOM)	28480	5040-4474
5040-7162	0	1		COVER (TOP)	28480	5040-7162
USED ON MODEL 18139A (MIL-188C) ONLY						
A2C11D	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2C11E	0180-0291	3	2	CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A2C11F	0180-0291	3		CAPACITOR-FXD 1UF +-10% 35VDC TA	56289	150D105X9035A2
A2C12E	0160-0576	5		CAPACITOR-FXD .1UF +-20% 50VDC CER	28480	0160-0576
A2R10D	0757-0280	3		RESISTOR 1K 1% .125W F TC=0+100	24546	C4-1/8-TO-1001-F
A2R10E	0757-0424	7	1	RESISTOR 1K 1% .125W F TC=0+-100	24546	C4-1/8-TO-1101-F
A2R10F	0698-3442	9	2	RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-TO-237R-F
A2R11D	0698-3442	9		RESISTOR 237 1% .125W F TC=0+-100	24546	C4-1/8-TO-237R-F
A2U11D	1826-0539	3	1	IC 317 VRGLTR TO-39	27014	LM317H
A2U11E	1826-0559	6	1	IC 337 VRGLTR TO-39	27014	LM337H

See introduction to this section for ordering information

*Indicates factory selected value

SECTION VII

MANUAL CHANGES

7-1. INTRODUCTION

This section contains information to backdate this manual for accessories with serial prefix numbers lower than listed on the Title Page. It may also contain information about the compatibility of the Interface Pods with the HP 4955A Protocol Analyzer.

7-2. MANUAL CHANGES

To adapt this manual to your accessory, make the changes listed in Table 7-1. Changes are listed by serial prefix. Sequence of changes is as listed. Check the accessory assembly date code and schematic/assembly date code. If different, more than one change may be listed in Table 7-1.

For accessory serial prefixes greater than the number listed on the title page, changes will be listed in the yellow MANUAL CHANGE supplement included with this manual.

Table 7-1. Manual Changes

HP 18135A Serial No.	Make Changes	HP 18139A Serial No.	Make Changes
2224A	1	2237A	1

CHANGE 1

SECTION VI,

Page 6-5, Table 6-3. Replaceable Parts

Add: A1C30C 0160-0576 CAPACITOR-FXD .1 UF $\pm 20\%$ 50VDC CER, CD=5, MFR CODE 28480, MFR P/N 0160-0576

A1C30D 0160-0576 CAPACITOR-FXD .1 UF $\pm 20\%$ 50VDC CER, CD=5, MFR CODE 28480, MFR P/N 0160-0576

Delete: A1R30E 1810-0406 NETWORK-RESISTOR 10K X 4 (18135A ONLY), CD=0, MFR CODE 02483, MFR P/N 750-83-R10K

A1R31C 1810-0406 NETWORK-RESISTOR 10K X 4 (18135A ONLY), CD=0, MFR CODE 02483, MFR P/N 750-83-R10K

A1R30D 1810-0275 NETWORK-RESISTOR 1K X 9 (18135A ONLY), CD=1, MFR CODE 05524, MFR P/N CSC10A01-102G

A1C40D 0160-4810 CAPACITOR-FXD 330PF $\pm 5\%$ 100VDC, MFR CODE 02798, MFR P/N CAC02COG331J100A

A1C41C 0160-4810 CAPACITOR-FXD 330PF $\pm 5\%$ 100VDC, MFR CODE 02798, MFR P/N CAC02COG331J100A

A1C42D 0160-4810 CAPACITOR-FXD 330PF $\pm 5\%$ 100VDC, MFR CODE 02798, MFR P/N CAC02COG331J100A

A1C43D 0160-4810 CAPACITOR-FXD 330PF $\pm 5\%$ 100VDC, MFR CODE 02798, MFR P/N CAC02COG331J100A

Change: A1R30D to A1R1, A1R3 and A1R5, PART NUMBER 0757-0420, CD=4, QTY 3, RESISTOR FIXED, 750 OHM $\pm 1\%$.125W F TC=0 ± 100 , MFR CODE 03292, MFR PART NO. C4-1/8-TO-751-F (REFERENCE FIGURE 7-3, MODEL 18135A ONLY)

A1R31C to A1R2, A1R4 and A1R6, PART NUMBER 0757-0442, CD=9, QTY 3, RESISTOR FIXED, 10K OHM $\pm 1\%$; TC=0 ± 100 , MFR CODE 03292, MFR PART NO. C4-1/8-TO-1002-F (REFERENCE FIGURE 7-3, MODEL 18135A ONLY)

SECTION VII,
Figure 8-4.

Replace A1 receiver portion of schematic with Figure 7-2

Figure 8-5.

Replace Model 18135A, A1 receiver component locator with Figure 7-1

Figure 8-6.

Replace Model 18135A, A1 receiver schematic with Figure 7-3

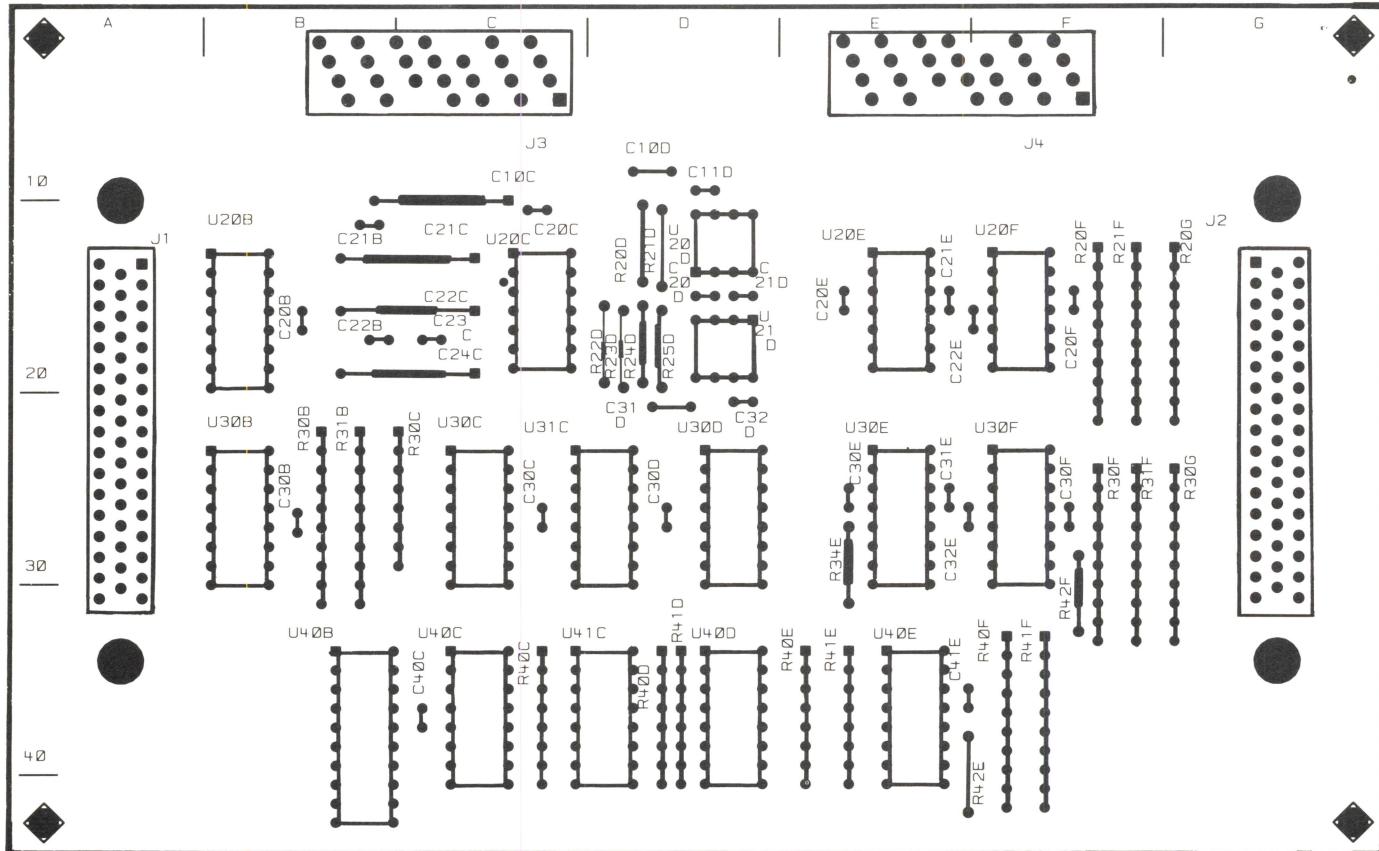


Figure 7-1. A1 Receiver Component Locator

18135-600010-130-10/82

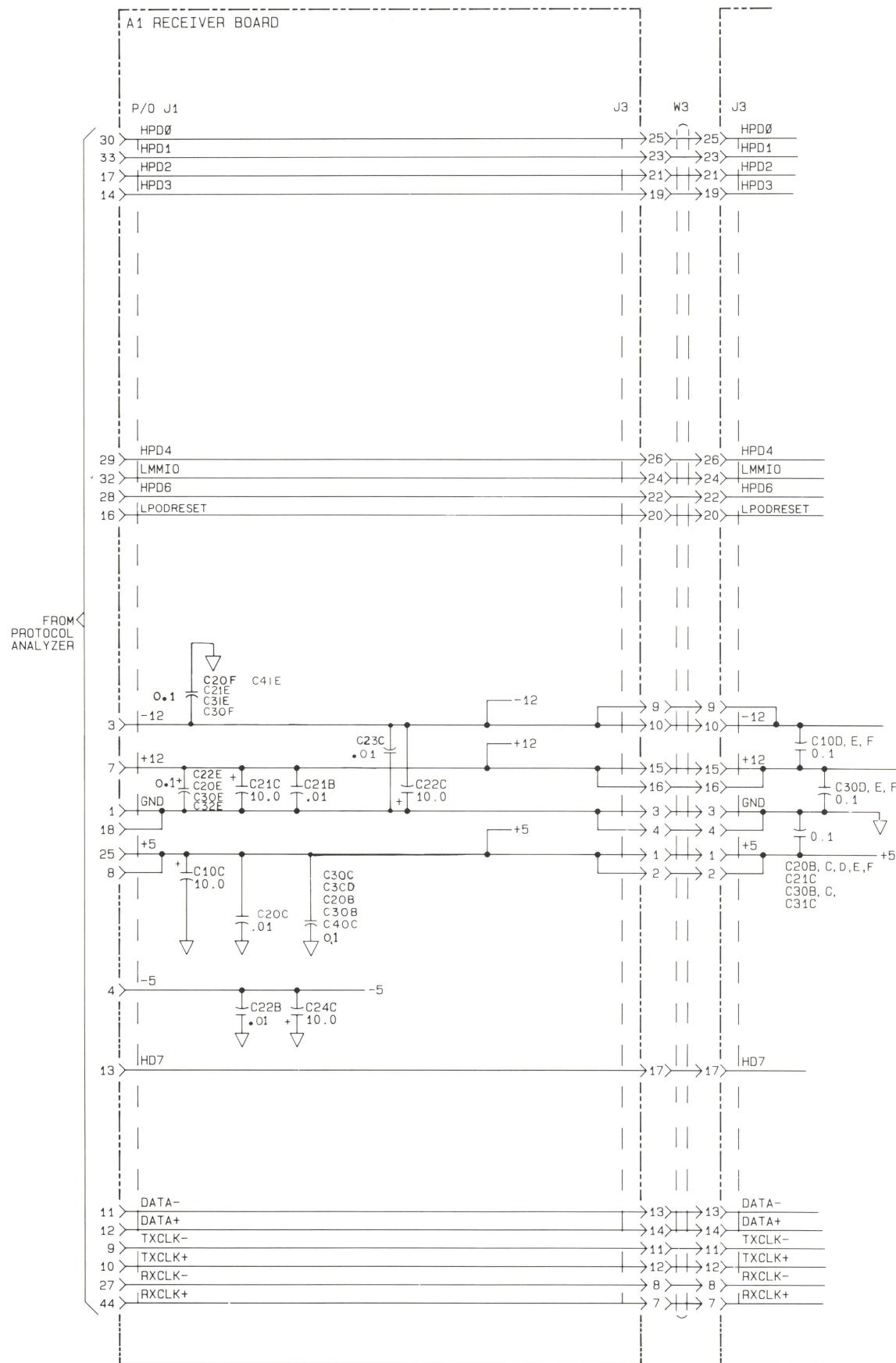


Figure 7-2. Replacement Insert for Figure 8-4.

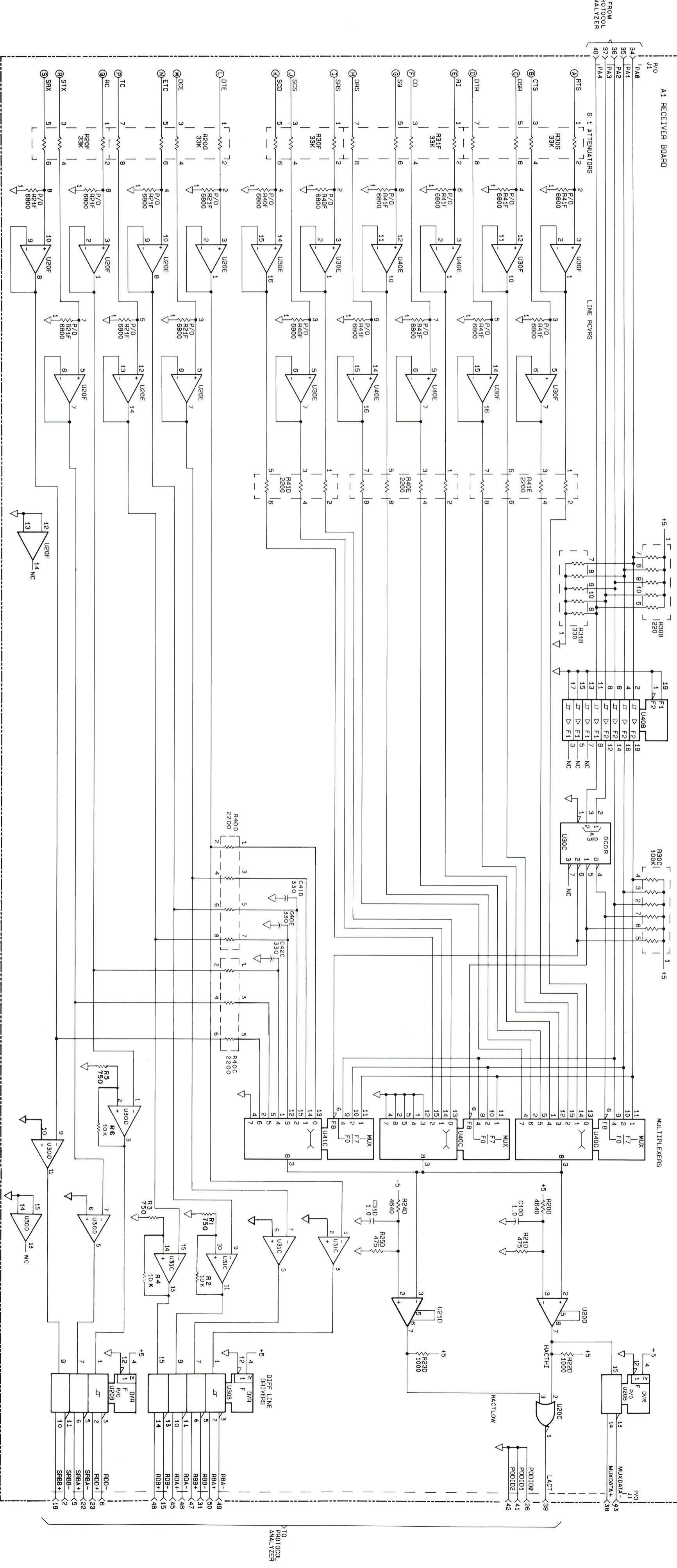
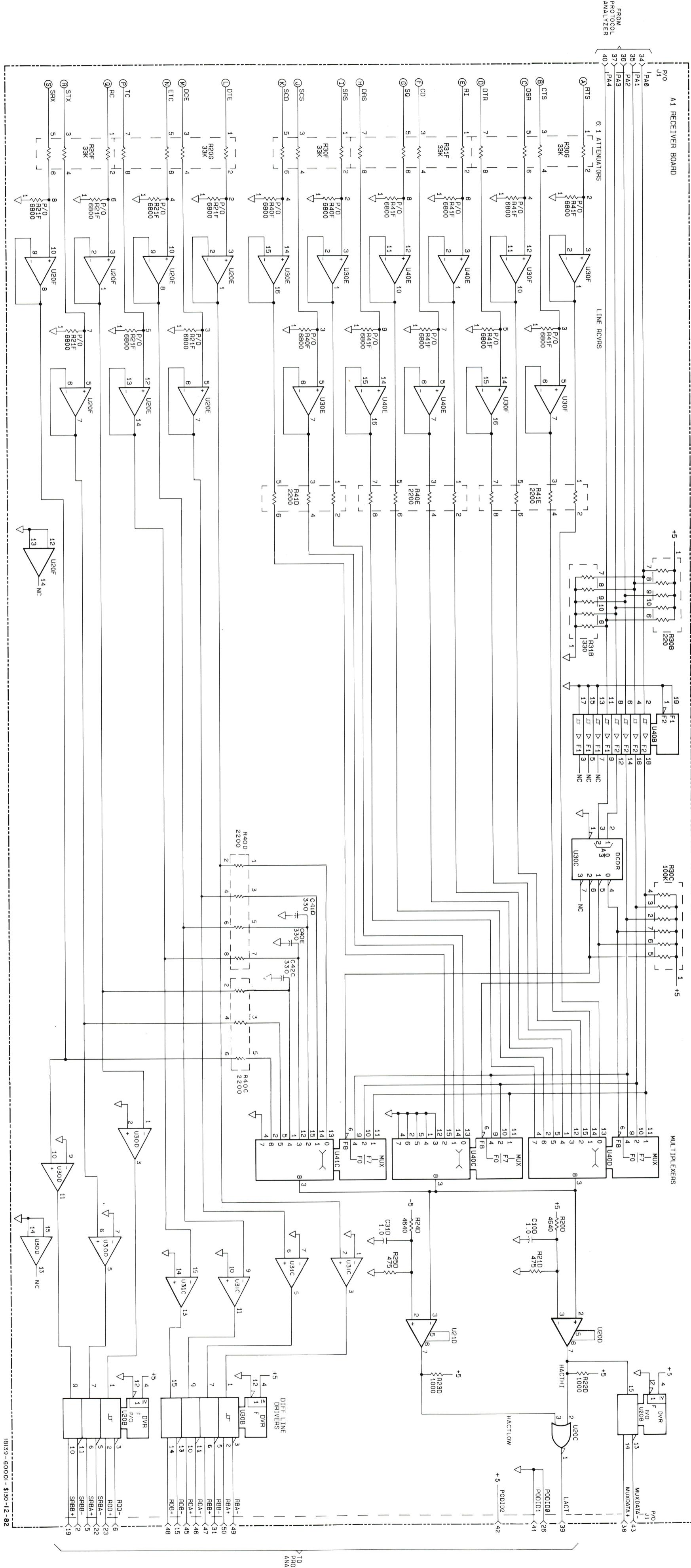


Figure 7-3. Replacement for Model 18135A A1 Receiver Schematic



SECTION VIII

SERVICE

8-1. INTRODUCTION

This section provides information on the HP 18135A RS-232C/V.24 and HP 18139A MIL-188C Interface Pods. Information includes theory of operation, block diagrams, component locators, and schematics for each printed circuit assembly. MIL-188C theory of operation is almost the same as RS-232C/V.24, exceptions are given in Paragraph 8-10.

Table 8-1 lists and describes all Interface Pod, RS-232C, and V.24 signal mnemonics. Table 8-2 lists and describes Interface Pod and MIL-188C signal mnemonics.

8-2. DISASSEMBLY/ASSEMBLY PROCEDURES

8-3. DISASSEMBLY



Turn off the 4955A Protocol Analyzer before disconnecting or connecting any Interface Pod.

1. Release the slide locks securing Instrument Pod Cable W1 to the Interface Pod and W2, the Interface Pod Y-cable between the Interface Pod and the network under test.
2. Unscrew and remove the four posidrive screws on the bottom cover of the Interface Pod.
3. Pull the top and bottom case covers apart.
4. Exposed will be the Transmitter and Receiver Boards. They are held together by two ribbon cables, four standoffs and eight screws. Disconnect the ribbon cables only if required by the troubleshooting procedure.
 - a. To separate the Transmitter and Receiver boards, remove them from the Interface Pod case covers.
 - b. Remove the four screws from the Receiver or Transmitter Board.
 - c. The boards will split apart, held together by the W3 and W4 cables.

8-4. ASSEMBLY

1. If necessary reconnect W3 and W4, the ribbon cables between the Transmitter and Receiver Boards.
2. Hold the Transmitter and Receiver Boards with the component sides together. Replace the four standoffs and tighten the eight screws.
3. Orient J1, the connector attaching the Interface Pod to the cable from the Protocol Analyzer with the HP 4955A label on the Interface Pod. Place the boards onto the pegs in the Interface Pod case.

4. Put the two sides of the Interface Pod case together. Insert the four posidrive screws and tighten.
5. Plug W1 from the Protocol Analyzer into the Interface Pod and W2 between the Interface Pod and the network under test.

CAUTION

When attaching cables to the Interface Pod, always fasten the slide locks to prevent damaging the cables and to assure a good electrical connection.

8-5. THEORY OF OPERATION

The HP 18135A RS-232C/V.24 and HP 18139A MIL-188C Interface Pods connect the HP 4955A Protocol Analyzer and the DTE or DCE data lines to be analyzed. There are two modes of operation, monitor and simulate.

The theory of operation refers to the block diagram in Figure 8-2. RS-232C/V.24 and MIL-188C are almost the same. Paragraph 8-10 describes the differences.

8-6. A1 RECEIVER BOARD

The Receiver operates in both simulate and monitor mode. In simulate mode, signals originated by the Protocol Analyzer are sent to the network under test. In monitor mode, signals are nonintrusively acquired from the network under test and sent to the Protocol Analyzer for analysis.

The seven clock and data signals from the network under test pass through level shifters U31C, U30D and go to the Protocol Analyzer as well as the comparators.

When a signal is selected for analysis, PA0-PA4 carry the signal address to the Receiver. The address is decoded by U30C and sent to multiplexers U40D, U40C, and U41C. Control signals from the network under test are scanned sequentially at a 3 usec rate. The signal is multiplexed to the Protocol Analyzer through the mark/space and line status comparators via the MUXDATA signal.

8-7. Line Status Comparators. Line status comparator U21D determines if the voltage level of the interface line is active low. A signal is active low if the voltage level is ≤ -3.0 volts.

Comparator U20D determines if the voltage level of the interface is active high. A signal is active high if the voltage level is $> +3.0$ volts. Figure 8-1 is a mark/space diagram for RS-232C.

8-8. Tri-State Detector. U20C combines the outputs of U20D and U21D and determines whether the line is tristate or at a valid voltage level.

There are eighteen addresses which may be selected for scanning. Address bus lines PA0-PA4 carry the address of the line selected to the Receiver.

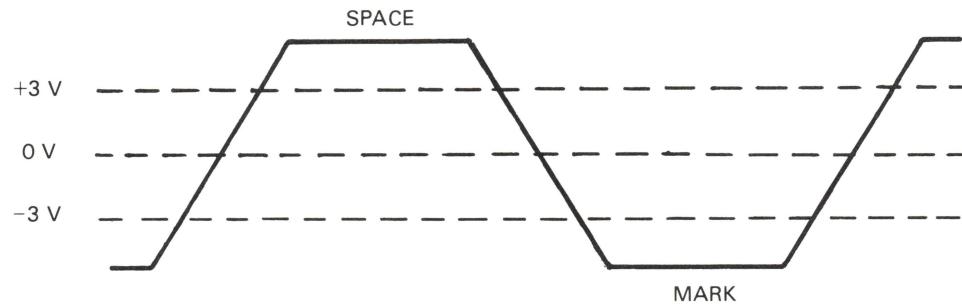


Figure 8-1. RS-232C Interface Line Mark/Space Diagram

8-9. A2 TRANSMITTER BOARD

The Transmitter allows the Protocol Analyzer to drive one or all of the lines of the network under test in simulate mode only. The following explanation refers to the block diagram in Figure 8-2.

4955A operator selected signals are configured by the Data Link Controller Board (DLC) in the Protocol Analyzer. All signals enter the Transmitter Board through cable W3 from the Receiver Board.

Data and clock signals DATA, TXCLK, and RXCLK go directly to the line drivers where they form seven data and clock signals.

Control signals on lines LMMIO, PDO-4, PD6, and PD7 pass through buffer U30A. These signals set up the 18 control signals in addressable latches U20A, U20B, and U20C. PDO-PD2 are the address select lines. LIMMO, PD3, and PD4 are decoded to become latch enables. Data is carried to the driver enable and control line latches by PD6 and PD7. From the latches signals pass to the line drivers. Each line is bit addressable, only one bit can be written to at a time.

8-10. MIL-188C

MIL-188C differs only slightly from RS-232C/V.24. On the Transmitter Board DATA ±inputs to U30C are inverted. On the Receiver Board the polarity of U31C pins 1 and 2 and 6 and 7 also U30D pins 6 and 7 and 9 and 10 is reversed. These exceptions are highlighted on the schematics.

Table 8-1. RS-232C/V.24 Signal Mnemonics

4955A SOFT LEDS	PIN NUMBER	INTERFACE POD LABEL		EIA CIRCUIT	DESCRIPTION
		MNEMONIC	CCITT		
DTE	1	open		AA	Protective Ground
	2	TX	103		Transmitted Data
	3	RX	104		Received Data
	4	RTS	105		Request To Send
	5	CTS	106		Clear To Send
	6	DSR	107		Data Set Ready
	7	GND	102		Signal Ground
	8	CDET	109		Received Line Signal Detector (carrier detect)
	9	open			unassigned
	10	open			unassigned
	11	open			unassigned
	12	SDET	122		Secondary Received line Signal Detector
	13	SCTS	121		Secondary Clear to Send
	14	STX	118		Transmitted Data
	15	TC	114		Transmit Signal Element
	16	SRX	119		Received Data
	17	RC	115		Receiver Signal Element Timing (Rcv clk) DCE Source
	18	open		SCA	unassigned
	19	SRTS	120		Secondary Request to Send
DTR	20	DTR	108.2	CD	Data Terminal Ready
SQ	21	SQ	140	CG	110 = Signal Quality Detector 140 = Remote Loopback
RI DRS	22	RI	125	CE	Ring Indicator
	23	DRS	111	CH	Data Signal Rate Selector
ETC	24	ETC	113	DA	Transmit Signal Element Timing (ext transmit clk) DTE source
	25	open			unassigned

Table 8-2. MIL-188C Signal Mnemonics

4955A SOFT LEDS	INTERFACE POD PIN NUMBER	INTERFACE POD MNEMONIC	DESCRIPTION
DTE	1	open	Protective Ground
	2	TX	Transmitted Data
DCE	3	RX	Received Data
RTS	4	RTS	Request To Send
CTS	5	CTS	Clear To Send
DSR	6	DSR	Data Set Ready
	7	GND	Signal Ground
CD	8	CDET	Received Line Signal Detector (carrier detect)
	9	open	unassigned
	10	open	unassigned
	11	open	unassigned
SCD	12	SDET	Secondary Received line Signal Detector
SCS	13	SCTS	Secondary Clear to Send
	14	STX	Transmitted Data
TC	15	TC	Transmit Signal Element
	16	SRX	Received Data
RC	17	RC	Receiver Signal
	18	open	Element Timing (Rcv clk) DCE Source
SRS	19	SRTS	unassigned
DTR	20	DTR	Secondary Request to Send
SQ	21	SQ	Data Terminal Ready
RI	22	RI	Signal Quality
DRS	23	DRS	Detector
ETC	24	ETC	Ring Indicator
	25	open	Data Signal Rate
			Selector
			Transmit Signal
			Element Timing (ext transmit clk) DTE
			source
			unassigned

8-11. RS-232C/V.24 INTERFACE POD TROUBLESHOOTING

The Interface Pod test is manually executed from the HP 4955A menu. It checks the functionality of all components in the pod except multiplexer A1U41C. All Interface Pod troubleshooting should be performed while the Interface Pod test is running. Disconnect the Pod from the customers network when running Performance Verification. Pod signals can be traced with a scope and control logic can be verified with signature analysis.

Execute the following Interface Pod test and observe the results.

1. If DLC-PP fails, check the following signal paths:
RTS, CTS, DSR, DTR, and DTE.
Also check line status comparators A1U20D and A1U21D.
2. If CONTROL LEAD fails, check the following signal paths:
RI, CD, SQ, DRS, SRS, SCS, and SCD.
3. If DATA/CLOCK fails, check the following signal paths:
DCE, ETC, TC, RC, STX, and SRX.
4. If the Interface Pod test passes, but the pod is still suspect, check A1U41C using the following procedure:
 - a. Exit from the HP 4955A Performance Verification menu to obtain the top level menu.
 - b. Select the RUN menu.
 - c. Press EXECUTE. The lead status will be displayed along the top of the display.
 - d. To test A1U41C channels 0-5, connect the following pins, one at a time to +5 V. The corresponding soft LED on the HP 4955A display should change from \otimes to \bullet as the pin is connected. As each pin is checked, disconnect it and connect the next one.

A1U41C Pin Number	Soft LED
13	DTE
14	DCE
15	ETC
12	TC
1	RC

5. If no trouble can be found on the Interface Pod, yet the Interface Pod test fails, check the Pod interface circuit on the A6 DLC board.

8-12. SIGNATURE ANALYSIS

LOOP <u>A</u>	PCA <u>A1 INTERFACE POD RECEIVER</u>		
TEST CONDITION	<u>4955A INTERFACE POD TEST RUNNING</u>		
NOTE	<u>These signatures check the Interface Pod receiver multiplexer addressing</u>		
JUMPERS	<u>None</u>		
SIGNATURES	NORM		
START	<u>+</u>	<u>A1U40B</u>	<u>PIN 11</u>
STOP	<u>+</u>	<u>A1U40B</u>	<u>PIN 11</u>
CLOCK	<u>+</u>	<u>A1U40B</u>	<u>PIN 2</u>
V _h	<u>0UP7</u>		
U30C-4	= 0U16		
5	= 0UP8		
6	= 00UP		
U40B-2	= 0000		
4	= 055H		
6	= 0334		
8	= 000U		
9	= 0U19		
11	= 0U19		
12	= 000U		
14	= 0334		
16	= 055H		
18	= 0000		

Before checking the signatures, verify the Vh signature (5456) by placing the data probe on +5V. If the Vh signature is 0000 instead of 5456, change the clock from - to + and back to minus while the data probe is on +5V. Do this several times until Vh = 5456. The signature Multiplexer is now synchronized with the Signature Analysis routine. Check that the clock is on - before continuing.

LOOP <u>B</u>	PCA <u>A2 INTERFACE POD TRANSMITTER BOARD</u>		
TEST CONDITION	<u>4955A INTERFACE POD TEST RUNNING</u>		
JUMPERS	<u>NONE</u>		
SIGNATURE	QUAL		
START/STOP	<u>+/+</u>	<u>A2U30A</u>	<u>PIN 17</u>
QUALIFIER	<u>-</u>	<u>A2U30A</u>	<u>PIN 13</u>
CLOCK	<u>-</u>	<u>A6U60C</u>	<u>PIN 6</u>
Vh = <u>FP54</u>			
U10C-4 = P6FP		U20C-4 = 3395	
5 = FH9P		5 = 672A	
6 = 9C3H		6 = FP54	
7 = 367C			
9 = 6FU7		U30A-2 = C6F6	
10 = H9PP		3 = FP54	
11 = C3HF		4 = P6FC	
12 = 67C9		5 = FP55	
		6 = 51FF	
U11C-4 = FU73		7 = 0000	
5 = 9PP6		8 = 5A74	
6 = 3HFH		9 = 00UU	
		11 = 00UU	
U20A-4 = 00UP		12 = 5A74	
5 = 003U		13 = 0000	
6 = 007U		14 = 51FF	
7 = 001U		15 = FP55	
9 = 0007		16 = P6FC	
10 = 000U		17 = FP54	
11 = 0003		18 = C6F6	
U20B-4 = P733		U30B-1 = 0000	
5 = FP67		2 = 5A74	
6 = 9FFP		3 = 00UU	
7 = 399F		4 = 5A8C	
9 = 7339		5 = 9420	
10 = P672		6 = 5A74	
11 = FFP5		11 = 3H33	
12 = 99FA		14 = U367	

8-13. LINE RECEIVER A2U30C VERIFICATION

1. Pins 5 and 11 should both have a 153 kHz square wave.
2. Using the Multimeter data probe, check that there is activity on A2U30C pin 3.

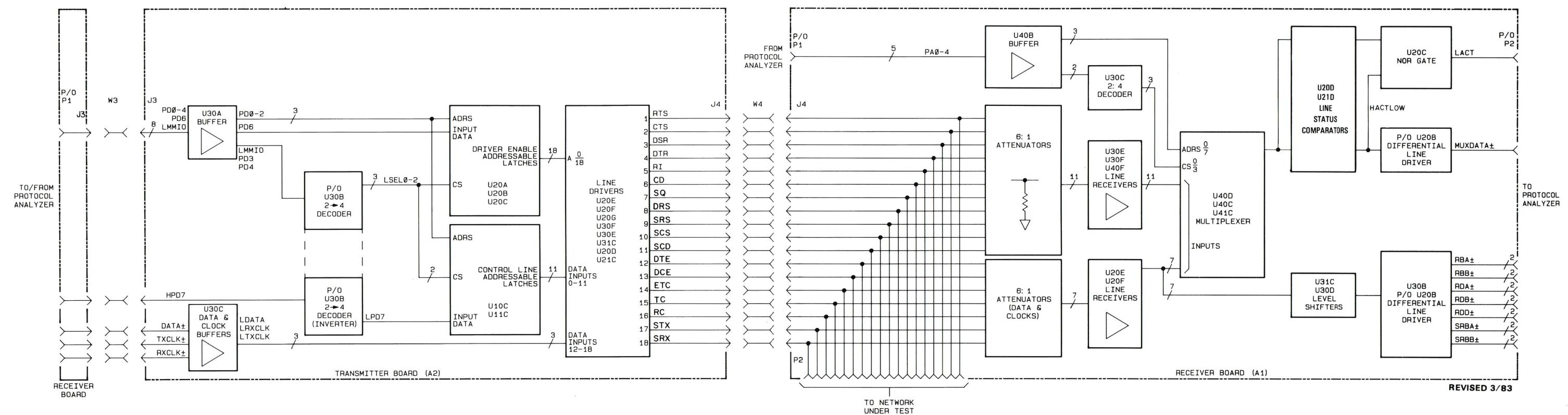
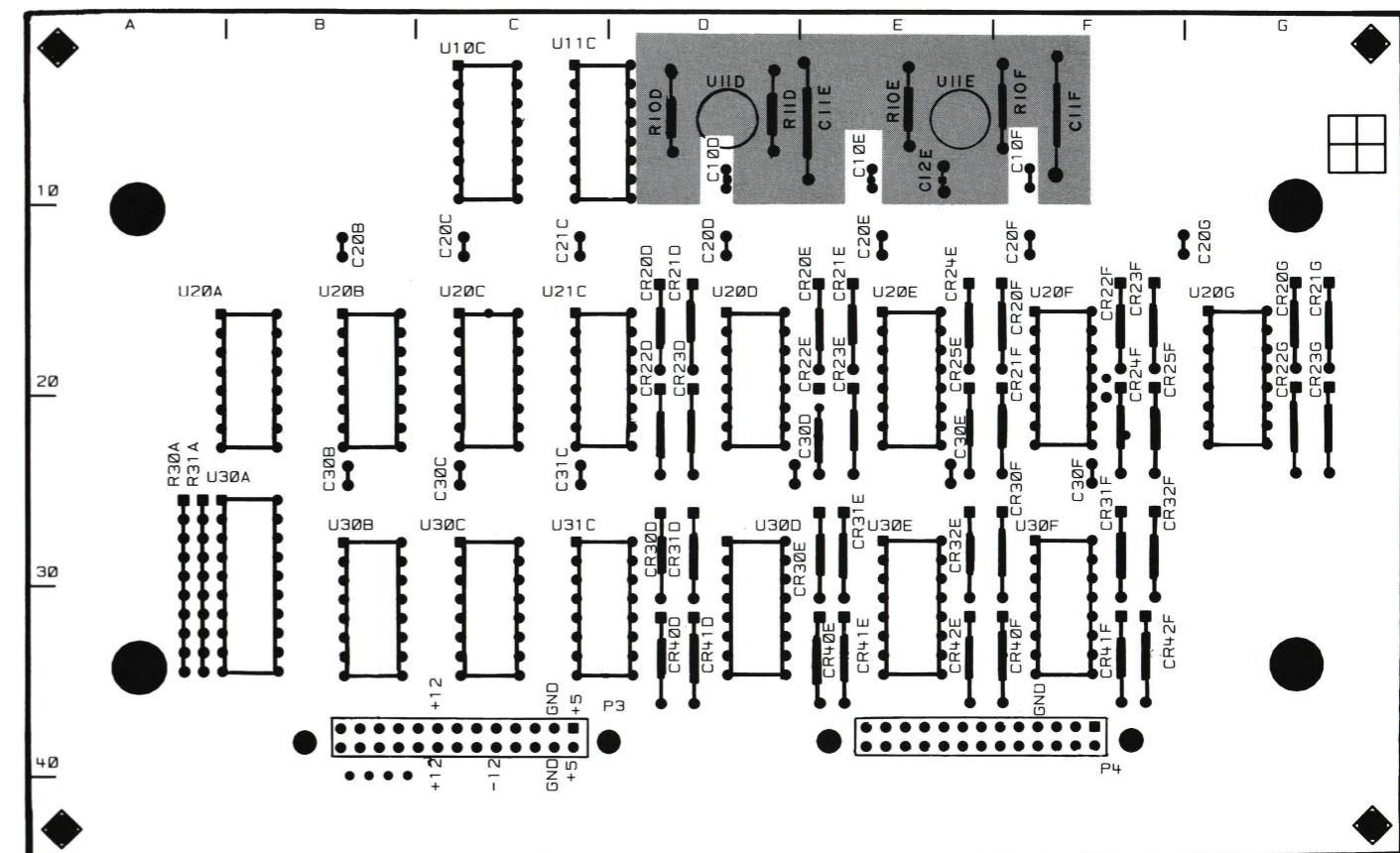


Figure 8-2. 18135A and 18139A Block Diagram



18135-600010-131-10/82

NOTE: Components in gray shaded area
appear only on the 18139A

Figure 8-3. A2 Transmitter Component Locator

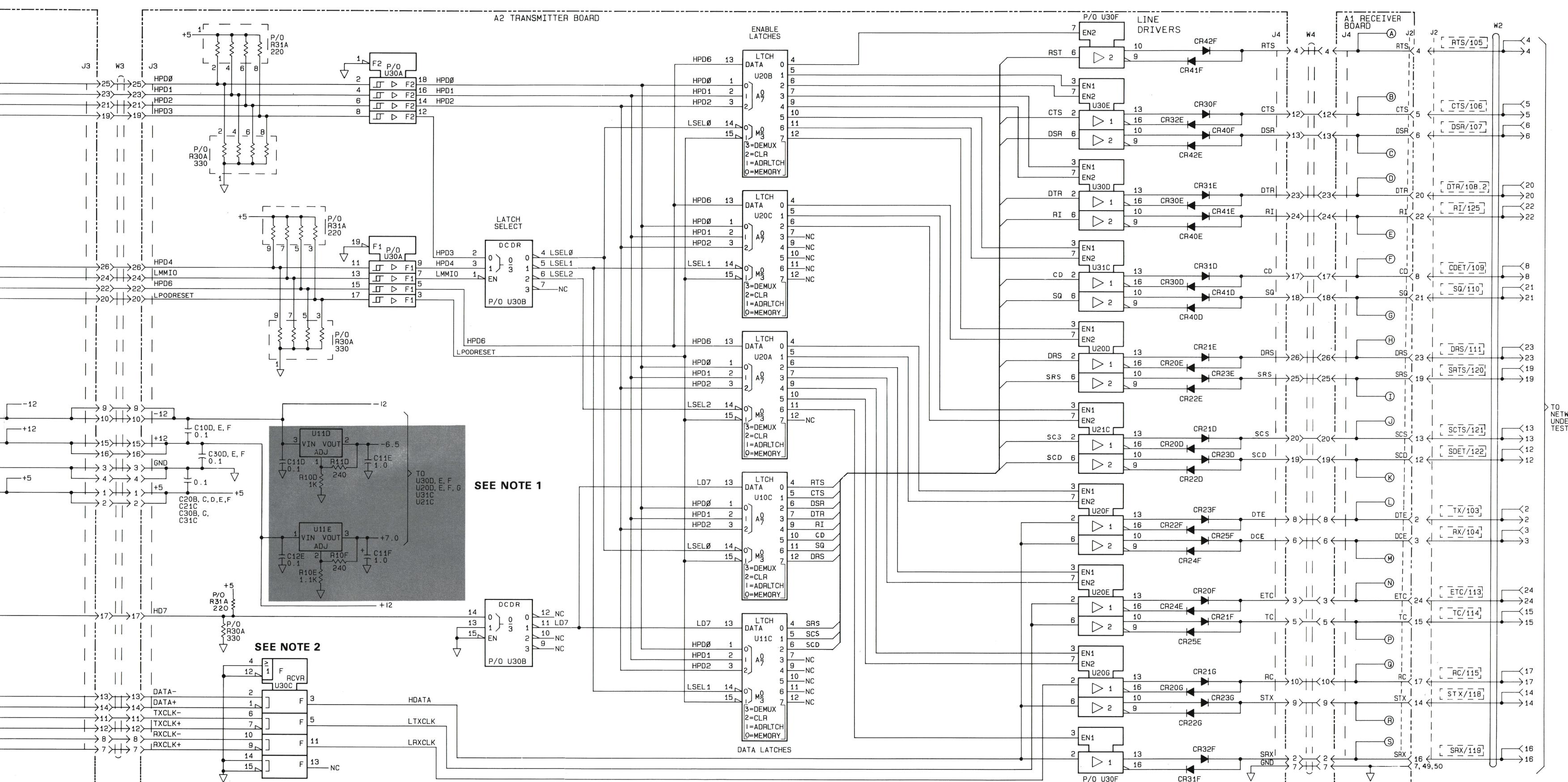
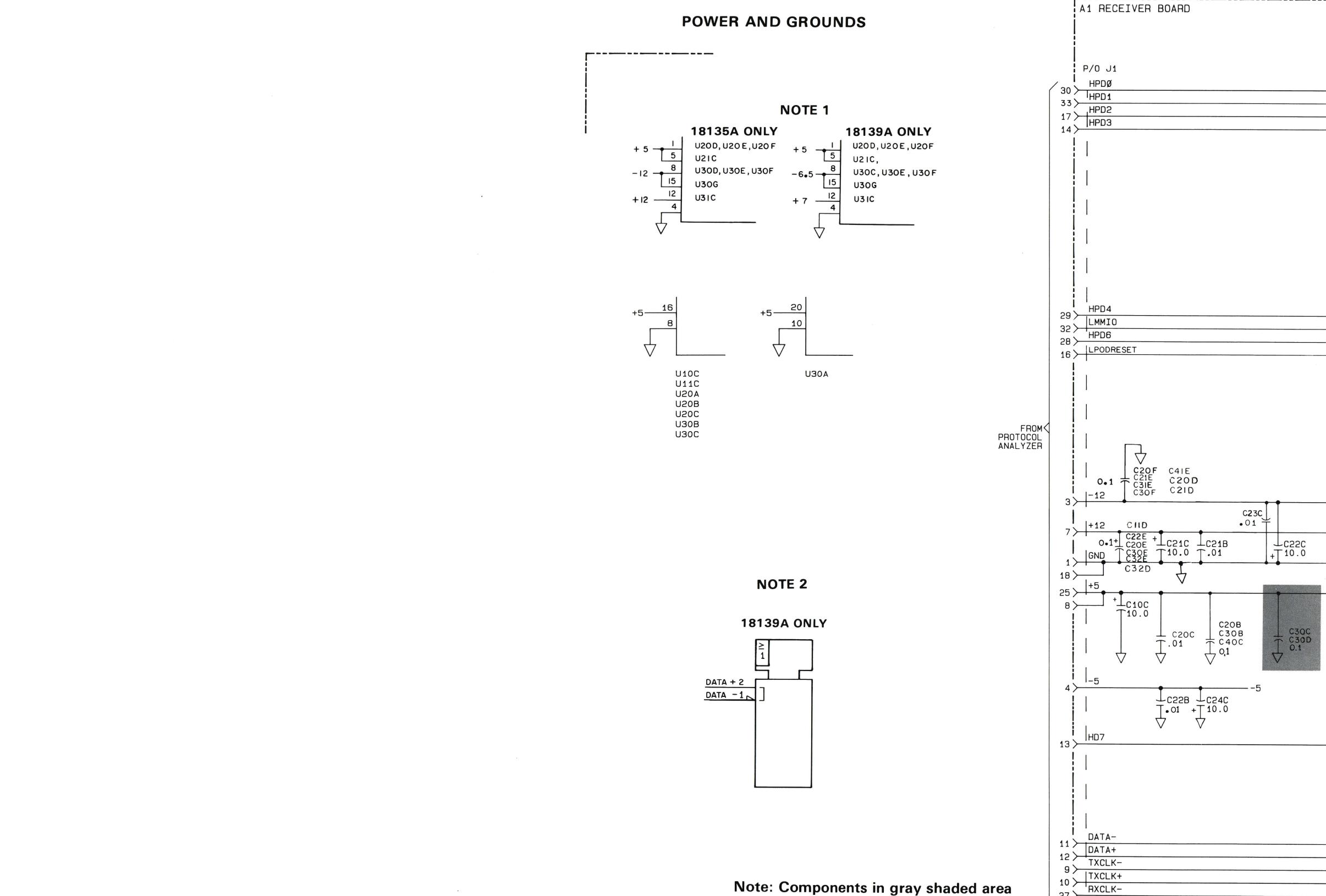


Figure 8-4. A Transmitter Schematic
-111



NOTE: Components in Gray Shaded area appear only on 1815A boards.

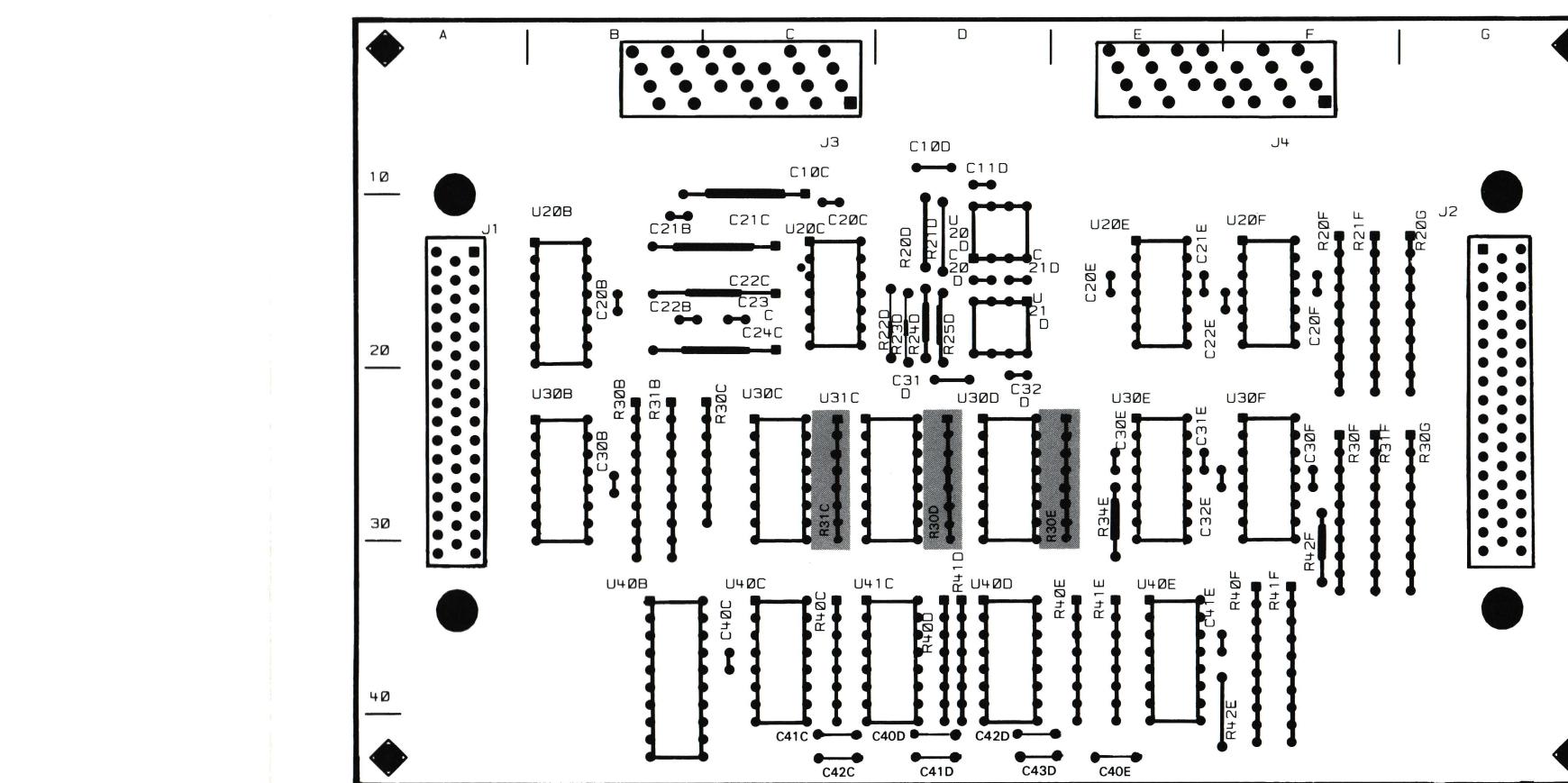
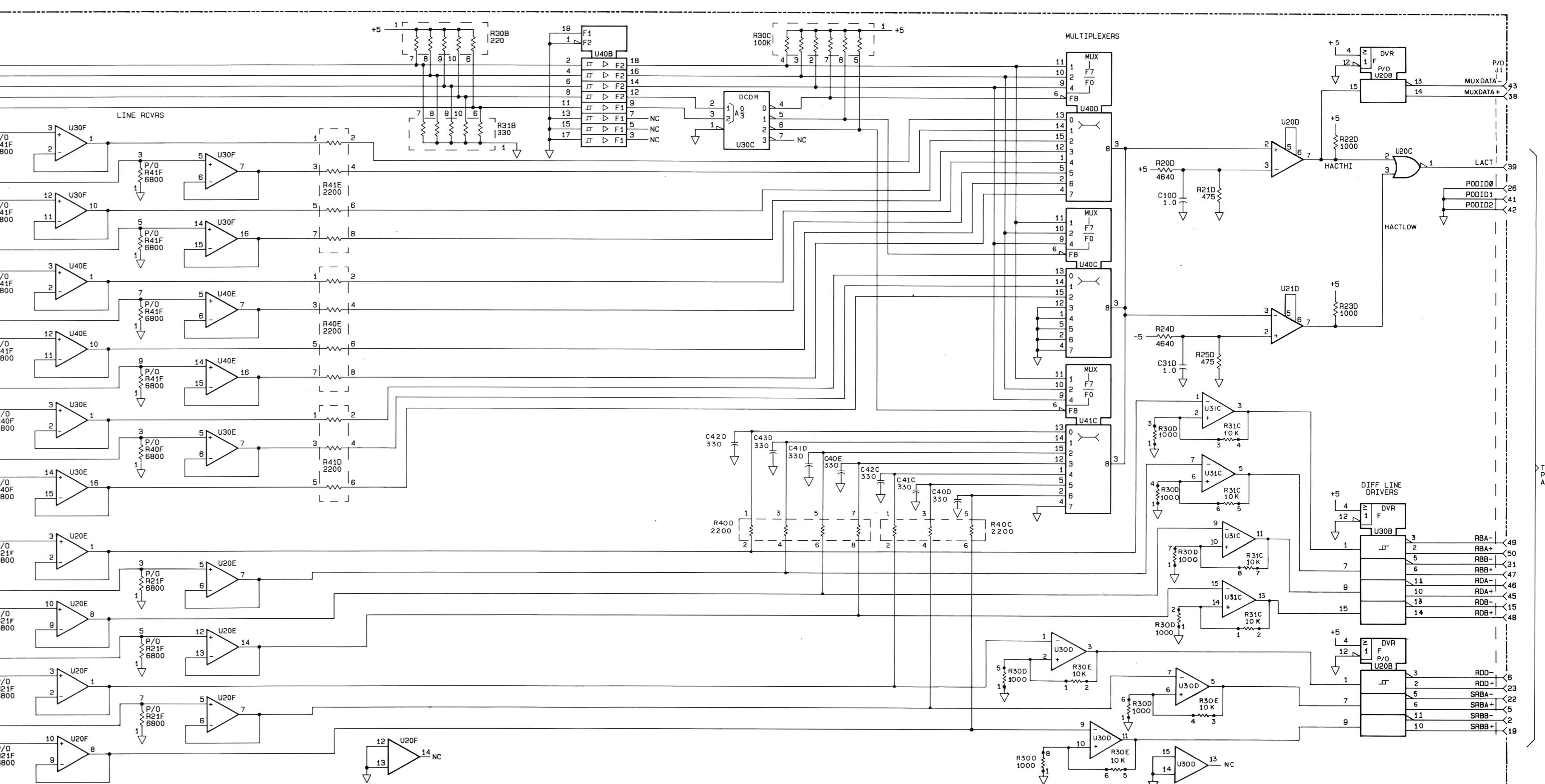
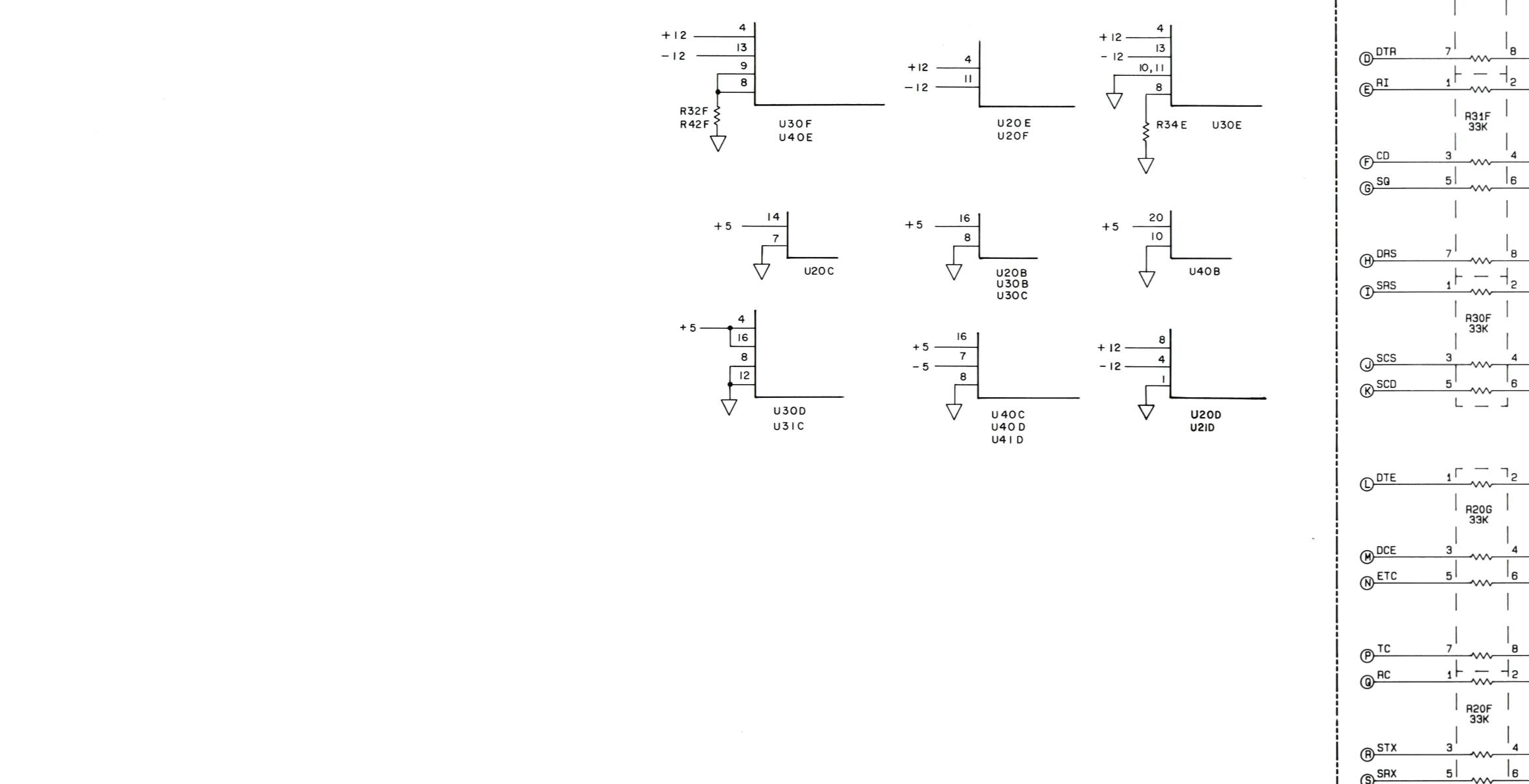


Figure 8-1.1 Receiver Component Location

OWER AND GROUNDS



**Figure 8-6. Model 18135A A1 Receiver Schematic
8-13/(8-14 blank)**

UNDS

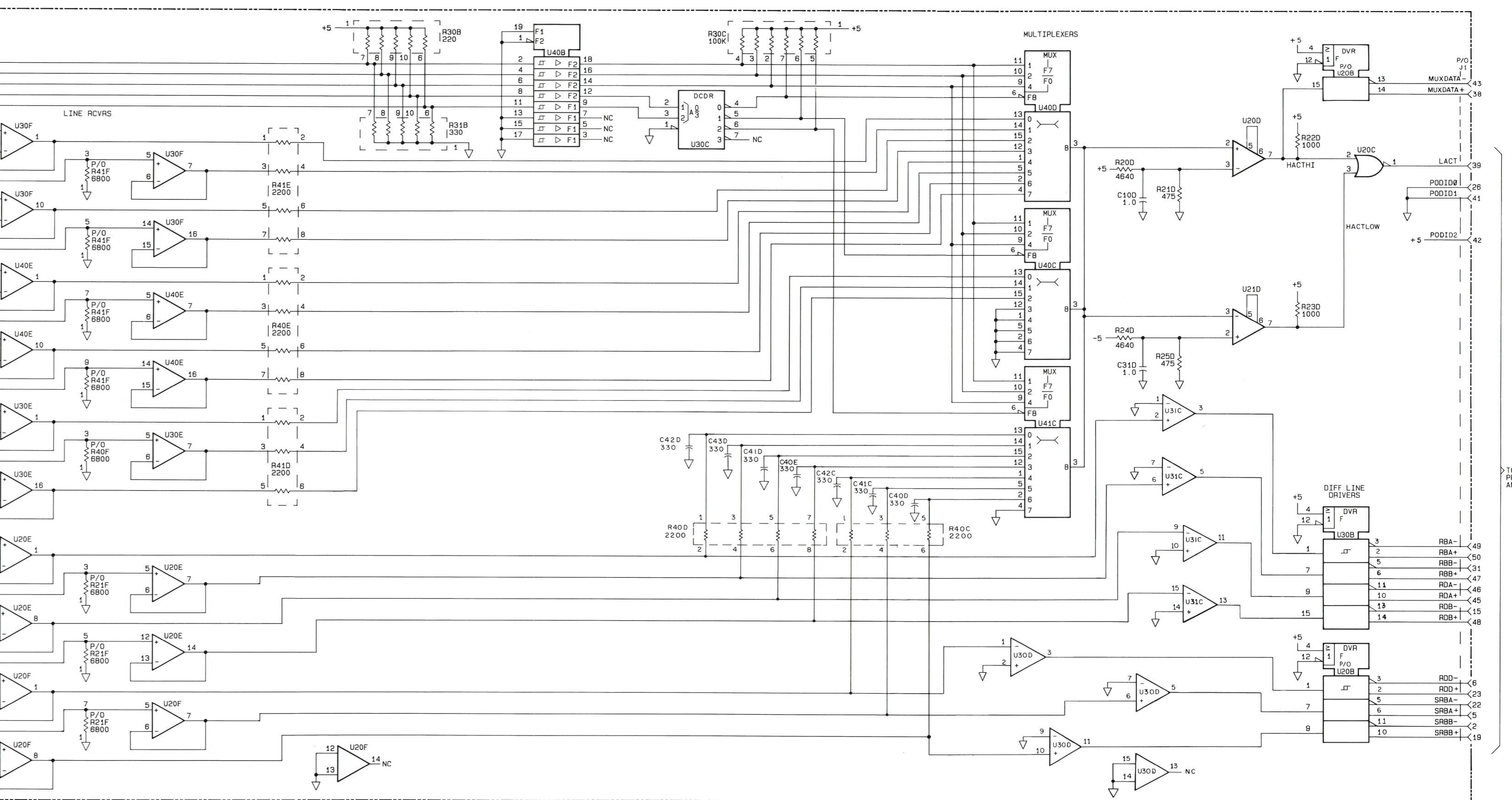
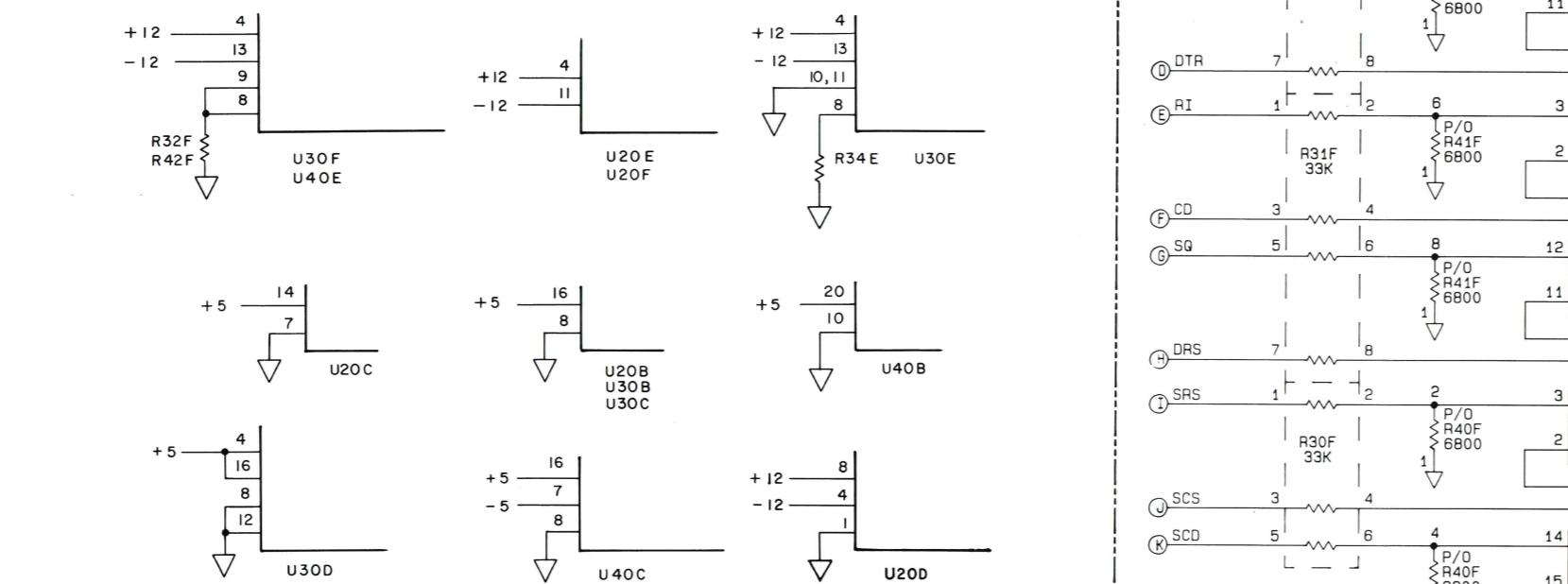


Figure 8-7. Model 18139A A1 Receiver Schematic

SALES & SUPPORT OFFICES

Arranged alphabetically by country

Product Line Sales/Support Key	Wael Pharmacy	Ontario	DENMARK	FRANCE (Cont.)	Hewlett-Packard France	Hewlett-Packard GmbH	"Plaiso"	Blue Star Ltd.	ISRAEL	MALAYSIA	PAKISTAN	PORTUGAL	SYRIA
Key Product Line	P.O. Box 648	Hewlett-Packard (Canada) Ltd.	Hewlett-Packard A/S	Hewlett-Packard France	20 Chemin de la Cépée	Technische Büro München	G. Gerados	Yokogawa-Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	Hewlett-Packard Sdn. Bhd.	Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	General Electric Co.
A - Analytical	Bahrain	552 Newbold Street	DK-3460 BIRKEROD	F-31081 TOULOUSE Cédex	Eschenstrasse 5	Technische Büro München	XXXVII-1379-2 M. G. Road	COINCH 682-016	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
CM - Components	Tel: 54886, 56123	London, Ontario N6C 2S5	Tel: (02) 81-66-40	28 Rue de la République	24 Stournaar Street	Eschenstrasse 5	G. Gerados	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	10, Bazar Road	COINCH 682-016	1. ter. av. de Darb 169
C - Computer Systems	Telex: 8550 WAEI GJ	Tel: (519) 686-9181	Telex: 37409 hps dk	25 Kremetenski Street	2 Suite 2/12/22	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	16 Kremetenski Street	69 Kyo-Machi kuta-Ku	10, Bazar Road	COINCH 682-016	1. ter. av. de Darb 169
CP - Computer Systems Primary Service Responsible Office (SRO)	M	Telex: 610-352-1201	A.CM,CP,E,MS,P	25-000 BESANCON	2 Sector G-6/4	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	16 Kremetenski Street	69 Kyo-Machi kuta-Ku	10, Bazar Road	COINCH 682-016	1. ter. av. de Darb 169
CS - Computer Systems Secondary SRO				Tel: (81) 83-16-22	25-000 BESANCON	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	16 Kremetenski Street	69 Kyo-Machi kuta-Ku	10, Bazar Road	COINCH 682-016	1. ter. av. de Darb 169
E - Electronic Instruments & Measurement Systems	Hewlett-Packard Belgium S.A./N.V.	Hewlett-Packard A/S	Hewlett-Packard France	20 Chemin de la Cépée	Technische Büro München	Technische Büro München	G. Gerados	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
M - Medical Products	Blvd. de la Wolwe, 100	Navervej 1	Hewlett-Packard France	Eschenstrasse 5	Technische Büro München	Technische Büro München	XXXVII-1379-2 M. G. Road	COINCH 682-016	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	10, Bazar Road	COINCH 682-016	1. ter. av. de Darb 169
MP - Medical Products Primary SRO	Woluwe	MISSISSAUGA, Ontario L4V 1M8	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	G. Gerados	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
MS - Medical Products Secondary SRO	B-1200 BRUSSELS	Telex: 610-492-2426	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
P - Personal Computing Products	Tel: (02) 762-32-00	Telex: 42-3494 paloben bru	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
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IMPORTANT: These symbols designate general product line capability. They do not insure sales or support availability for all products within a line, at all locations. Contact your local sales office for information regarding locations where HP support is available for specific products.													
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Electra	Hewlett-Packard Australia Pty. Ltd.	Hewlett-Packard (Brazil) I.E.C.	Hewlett-Packard A/S	F-31081 TOULOUSE Cédex	20 Chemin de la Cépée	Technische Büro München	G. Gerados	Yokogawa-Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	Hewlett-Packard Sdn. Bhd.	Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	General Electric Co.
Empresa Técnica de Equipamentos Eléctricos, S.A.R.L.	121 Wollongong Street	Immeuble des Mouilles	Hewlett-Packard France	Eschenstrasse 5	Technische Büro München	Technische Büro München	XXXVII-1379-2 M. G. Road	COINCH 682-016	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
R. Barbosa Rodrigues, 41-DT.	FYNSWICK, A.C.T. 2069	Chemins de la Lévee	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
Caixa Postal 6487	Avenida Rio Negro, 750	Telex: 610-563-1636	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
LUANDA	Alameda 2000 Barueri SP	Telex: 421-1311	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
A*,E,M,P													
ARGENTINA	Hewlett-Packard Argentina S.A.	1-31-41 Joseph Street	Hewlett-Packard Argentina S.A.	20 Chemin de la Cépée	Technische Büro München	Technische Büro München	G. Gerados	Yokogawa-Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	Hewlett-Packard Sdn. Bhd.	Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	General Electric Co.
Avenida Se 2035	121-00-2000	BLACKBURN, Victoria 3130	Hewlett-Packard Argentina S.A.	Eschenstrasse 5	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
Martinez 1640 BUENOS AIRES	Telex: 798-575, 792-1293	Telex: 31-024	Hewlett-Packard Argentina S.A.	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
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Empresa Técnica de Equipamentos Eléctricos, S.A.R.L.	121 Wollongong Street	B.P. 553	Hewlett-Packard France	Eschenstrasse 5	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
R. Barbosa Rodrigues, 41-DT.	FYNSWICK, A.C.T. 2069	Telex: 610-422-3022	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
Caixa Postal 6487	Avenida Epitacio Pessoa, 4664	Telex: 286-0237	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
LUANDA	22471 RIO DE JANEIRO-RJ	Telex: 21-02195 HPBR-BR	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
A*,E,M,P													
ARGENTINA	Hewlett-Packard Argentina S.A.	1-31-41 Joseph Street	Hewlett-Packard Argentina S.A.	20 Chemin de la Cépée	Technische Büro München	Technische Büro München	G. Gerados	Yokogawa-Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	Hewlett-Packard Sdn. Bhd.	Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	General Electric Co.
Avenida Se 2035	121-00-2000	BLACKBURN, Victoria 3130	Hewlett-Packard Argentina S.A.	Eschenstrasse 5	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
Martinez 1640 BUENOS AIRES	Telex: 798-575, 792-1293	Telex: 31-024	Hewlett-Packard Argentina S.A.	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
A*,E,M,P													
ANGOLA	Canberra, Australia Capital Office	BURUNDI	DENMARK	FRANCE (Cont.)	Hewlett-Packard France	Hewlett-Packard GmbH	"Plaiso"	Blue Star Ltd.	ISRAEL	MALAYSIA	PAKISTAN	PORTUGAL	SYRIA
Electra	Hewlett-Packard Australia Pty. Ltd.	Typemecca S.P.R.L.	Hewlett-Packard A/S	F-31081 TOULOUSE Cédex	20 Chemin de la Cépée	Technische Büro München	G. Gerados	Yokogawa-Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	Hewlett-Packard Sdn. Bhd.	Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	General Electric Co.
Empresa Técnica de Equipamentos Eléctricos, S.A.R.L.	121 Wollongong Street	B.P. 553	Hewlett-Packard France	Eschenstrasse 5	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
R. Barbosa Rodrigues, 41-DT.	FYNSWICK, A.C.T. 2069	Telex: 610-422-3022	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
Caixa Postal 6487	Avenida Epitacio Pessoa, 4664	Telex: 286-0237	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
LUANDA	22471 RIO DE JANEIRO-RJ	Telex: 21-02195 HPBR-BR	Hewlett-Packard France	24 Stournaar Street	Technische Büro München	Technische Büro München	ATHENS	Yokogawa-Hewlett-Packard Ltd.	D-8021 TAUFRICHEN	69 Kyo-Machi kuta-Ku	4-12 Crackshank Street	COINCH 682-016	1. ter. av. de Darb 169
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ARGENTINA	Hewlett-Packard Argentina S.A.	1-31-41 Joseph Street	Hewlett-Packard Argentina S.A.	20 Chemin de la Cépée	Technische Büro München	Technische Büro München	G. Gerados	Yokogawa-Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	Hewlett-Packard Sdn. Bhd.	Hewlett-Packard Ltd.	Hewlett-Packard Ltd.	General Electric Co.
Avenida Se 2035	121-00-2000	BLACKBURN, Victoria 3130	Hewlett-Packard Argentina S.A.	Eschenstrasse 5	Technische Büro München	Technische Büro München	ATH						

SALES & SUPPORT OFFICES

Arranged alphabetically by country

2



UNITED STATES (Cont.)

California

Hewlett-Packard Co.
7621 Canoga Avenue
CANOGA PARK, CA 91304
Tel: (213) 702-8300
A,CM,CP,E,P

Hewlett-Packard Co.
1579 W. Shaw Avenue
FRESNO, CA 93771
Tel: (209) 224-0582
CM,MS

Hewlett-Packard Co.
1430 East Orangethorpe
FULLERTON, CA 92631
Tel: (714) 870-1000
CM,CP,E,MP

Hewlett-Packard Co.
5400 W. Rosedrums Boulevard
LAWNDALE, CA 90260
P.O. Box 92105

LOS ANGELES, CA 90009
Tel: (213) 970-7500
CM,CP,MP

Hewlett-Packard Co.
3939 Lankershim Blvd.
NORTH HOLLYWOOD, CA 91604
Tel: (213) 877-1282

Regional Headquarters
Hewlett-Packard Co.

3200 Hillview Avenue
PALO ALTO, CA 94304
Tel: (415) 857-8000
CM,CP,E

Hewlett-Packard Co.
646 W. North Market Boulevard
SACRAMENTO, CA 95834
Tel: (916) 929-7222
A*,CM,CP,E,MS

Hewlett-Packard Co.
9606 Aero Drive
P.O. Box 23333
SAN DIEGO, CA 92123
Tel: (714) 279-3200
CM,CP,E,MP

Hewlett-Packard Co.
3003 Scott Boulevard
SANTA CLARA, CA 95050
Tel: (408) 988-7000
A,CM,CP,E,MP

Hewlett-Packard Co.
454 Carlton Court
SO. SAN FRANCISCO, CA 94080
Tel: (415) 877-0772
CM,CP

Colorado

Hewlett-Packard Co.
24 Inverness Place, East
ENGLEWOOD, CO 80112
Tel: (303) 771-3455
A,CM,CP,E,MS

Connecticut

Hewlett-Packard Co.
47 Barnes Industrial Road South
P.O. Box 5007
WALLINGFORD, CT 06492
Tel: (203) 265-7801
A,CM,CP,E,MS

Florida

Hewlett-Packard Co.
P.O. Box 24210
2727 N.W. 62nd Street
FORT LAUDERDALE, FL 33309
Tel: (305) 973-2600
CM,CP,E,MS

Hewlett-Packard Co.
4080 Woodcock Drive, #132
Brownell Building
JACKSONVILLE, FL 32207
Tel: (904) 398-0663
CM,C*,E*,MS**

Hewlett-Packard Co.
P.O. Box 13910
6177 Lake Ellenor Drive
ORLANDO, FL 32809
Tel: (305) 859-2900
A,CM,CP,E,MS

Hewlett-Packard Co.
6425 N. Pensacola Blvd.
Suite 4, Building 1
PENSACOLA, FL 32575
Tel: (904) 476-8422
A,CM,MS

Hewlett-Packard Co.
110 South Hoover, Suite 120
Vanguard Bldg.
TAMPA, FL 33609
Tel: (813) 872-0900
A*,CM,CS,E*,M*

Georgia
Hewlett-Packard Co.
P.O. Box 105005
2000 South Park Place
ATLANTA, GA 30339
Tel: (404) 955-1500
Telex: 810-766-4890
A,CM,CP,E,MP

Hewlett-Packard Co.
Executive Park Suite 306
P.O. Box 816
AUGUSTA, GA 30907
Tel: (404) 736-0592
CM,MS

Hewlett-Packard Co.
P.O. Box 2103
1172 N. Davis Drive
WARNER ROBINS, GA 31098
Tel: (912) 922-0449
CM,E

Hawaii
Hewlett-Packard Co.
Kawaihaao Plaza, Suite 190
567 South King Street
HONOLULU, HI 96813
Tel: (808) 526-1555
A,CM,CS,E,MS

Idaho
Hewlett-Packard Co.
11311 Chinden Boulevard
BOISE, ID 83707
Tel: (208) 376-6000
CM,CS,M*

Illinois
Hewlett-Packard Co.
211 Prospect Road
BLOOMINGTON, IL 61701
Tel: (309) 663-0383
CM,CS,MS**

Hewlett-Packard Co.
1100 31st Street
DOWNSERS GROVE, IL 60515
Tel: (312) 960-5760
CM,CP

Hewlett-Packard Co.
5201 Tollview Drive
ROLLING MEADOWS, IL 60008
Tel: (312) 255-9800
A,CM,CP,E,MP

Indiana
Hewlett-Packard Co.
P.O. Box 50807
7301 No. Shadeland Avenue
INDIANAPOLIS, IN 46250
Tel: (317) 842-1000
A,CM,CS,E,MS

Iowa
Hewlett-Packard Co.
2415 Heinz Road
IOWA CITY, IA 52240
Tel: (319) 351-1020
CM,CS,E*,MS

Kansas
Hewlett-Packard Co.
1644 S. Rock
WICHITA, KA 67207
Tel: (316) 265-5200
CM,CS

Kentucky
Hewlett-Packard Co.
10170 Linn Station Road
Suite 525
LOUISVILLE, KY 40223
Tel: (502) 426-0100
A,CM,CS,MS

Louisiana
Hewlett-Packard Co.
P.O. Box 1449
3229 New Orleans Boulevard
KENNER, LA 70062
Tel: (504) 443-6201
A,CM,CS,E,MS

Maryland
Hewlett-Packard Co.
7121 Standard Drive
HANOVER, MD 21076
Tel: (301) 796-7700
A,CM,CP,E,MS

Hewlett-Packard Co.
2 Choke Cherry Road
ROCKVILLE, MD 20850
Tel: (301) 948-6370
Telex: 710-828-9685
A,CM,CP,E,MP

Massachusetts
Hewlett-Packard Co.
32 Hartwell Avenue
LEXINGTON, MA 02173
Tel: (617) 861-8960
A,CM,CP,E,MP

Michigan
Hewlett-Packard Co.
23855 Research Drive
FARMINGTON HILLS, MI 48024
Tel: (313) 476-6400
A,CM,CP,E,MP

Hewlett-Packard Co.
4326 Cascade Road S.E.
GRAND RAPIDS, MI 49506
Tel: (616) 957-1970
CM,CS,MS

Minnesota
Hewlett-Packard Co.
2025 W. Larpenteur Ave.
ST. PAUL, MN 55113
Tel: (612) 644-1100
A,CM,CP,E,MP

Mississippi
Hewlett-Packard Co.
P.O. Box 5028
322 N. Mart Plaza
JACKSON, MS 39216
Tel: (601) 982-9363
CM,MS

Missouri
Hewlett-Packard Co.
11131 Colorado Avenue
KANSAS CITY, MO 64137
Tel: (816) 763-8000
Telex: 910-771-2087
A,CM,CS,E,MS

Hewlett-Packard Co.
1024 Executive Parkway
ST. LOUIS, MO 63141
Tel: (314) 878-0200
A,CM,CP,E,MP

Hewlett-Packard Co.
3 Crossways Park West
WOODBURY, NY 11797
Tel: (315) 455-2486
A,CM,CS,E,MS

Hewlett-Packard Co.
3 Crossways Park West
WOODBURY, NY 11797
Tel: (315) 455-2486
A,CM,CS,E,MS

Nebraska
Hewlett-Packard Co.
7101 Mercy Road
Suite 101, IBX Building
OMAHA, NE 68106
Tel: (402) 392-0948
CM,MS

Nevada
Hewlett-Packard Co.
Suite D-130
5030 Paradise Blvd.
LAS VEGAS, NV 89119
Tel: (702) 736-6610
CM,MS**

New Jersey
Hewlett-Packard Co.
Crystal Brook Professional Building
Route 35
EATONTOWN, NJ 07724
Tel: (201) 542-1384
A*,CM,C*,E*,P*

Hewlett-Packard Co.
W120 Century Road
PARAMUS, NJ 07652
Tel: (201) 265-5000
A,CM,CP,E,MP

Hewlett-Packard Co.
60 New England Avenue West
PISCATAWAY, NJ 08854
Tel: (201) 981-1199
A,CM,CP,E

New Mexico
Hewlett-Packard Co.
P.O. Box 11634
11300 Lomas Blvd. N.E.
ALBUQUERQUE, NM 87123
Tel: (505) 292-1330
Telex: 910-989-1185
CM,CP,E,MS

New York
Hewlett-Packard Co.
5 Computer Drive South
ALBANY, NY 12205
Tel: (518) 458-1550
Telex: 710-444-4691
A,CM,CS,E,MS

Hewlett-Packard Co.
9600 Main Street
CLARENCE, NY 14031
Tel: (716) 759-8621
Telex: 710-523-1893
Hewlett-Packard Co.
200 Cross Keys Office
FAIRPORT, NY 14450
Tel: (716) 223-9950
Telex: 510-253-0092
CM,CP,E,MS

Hewlett-Packard Co.
No. 1 Pennsylvania Plaza
55th Floor
34th Street & 8th Avenue
NEW YORK, NY 10119
Tel: (212) 971-0800
CM,CP,E,M*

Hewlett-Packard Co.
5858 East Molloy Road
SYRACUSE, NY 13211
Tel: (315) 455-2486
A,CM,CS,E,MS

Hewlett-Packard Co.
3 Crossways Park West
WOODBURY, NY 11797
Tel: (315) 455-2486
A,CM,CS,E,MS

North Carolina
Hewlett-Packard Co.
P.O. Box 15579
2905 Guess Road (27705)
DURHAM, NC 27704
Tel: (919) 471-8466
CM

Hewlett-Packard Co.
5605 Roanne Way
GREENSBORO, NC 27409
Tel: (919) 852-1800
A,CM,CP,E,MS

Ohio
Hewlett-Packard Co.
9920 Carver Road
CINCINNATI, OH 45242
Tel: (513) 891-9870
CM,CP,MS

Hewlett-Packard Co.
16500 Sprague Road
CLEVELAND, OH 44130
Tel: (216) 243-7300
Telex: 810-423-9430
A,CM,CP,E,MS

Hewlett-Packard Co.
962 Crupper Ave.
COLUMBUS, OH 43229
Tel: (614) 436-1041
CM,CP,E*

Hewlett-Packard Co.
330 Progress Rd.
DAYTON, OH 45449
Tel: (513) 859-8202
A,CM,CP,E,MS

Oklahoma
Hewlett-Packard Co.
P.O. Box 366
1503 W. Gore Blvd., Suite #22
LAWTON, OK 73502
Tel: (405) 248-4248
C

Hewlett-Packard Co.
P.O. Box 32008
304 N. Meridian Avenue, Suite A
OKLAHOMA CITY, OK 73107
Tel: (405) 946-9499
A*,CM,CP,E,MS

Hewlett-Packard Co.
Suite 121
9920 E. 42nd Street
TULSA, OK 74145
Tel: (918) 665-3300
A**,CM,CS,M*

Oregon
Hewlett-Packard Co.
1500 Valley River Drive, Suite 330
EUGENE, OR 97401
Tel: (503) 683-8075
C

Hewlett-Packard Co.
9255 S. W. Pioneer Court
WILSONVILLE, OR 97070
Tel: (503) 682-8000
A,CM,CP,E,MS

Pennsylvania
Hewlett-Packard Co.
1021 8th Avenue
King of Prussia Industrial Park
KING OF PRUSSIA, PA 19406
Tel: (215) 265-7000
Telex: 510-660-2670
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Hewlett-Packard Co.
111 Zeta Drive
PITTSBURGH, PA 15238
Tel: (412) 782-0400
A,CM,CP,E,MP

South Carolina
Hewlett-Packard Co.
P.O. Box 6442
6941-0 N. Trenholm Road
COLUMBIA, SC 29260
Tel: (803) 782-6493
CM,CS,E,MS

SALES & SUPPORT OFFICES

Arranged alphabetically by country

UNITED STATES (Cont.)

South Carolina (Cont.)

Hewlett-Packard Co.
814 Wade Hampton Blvd.
Suite 10
GREENVILLE, SC 29609
Tel: (803) 232-0917
C

Tennessee

Hewlett-Packard Co.
P.O. Box 22490
224 Peters Road
Suite 102
KNOXVILLE, TN 37922
Tel: (615) 691-2371
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3070 Directors Row
MEMPHIS, TN 38131
Tel: (901) 346-8370
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Hewlett-Packard Co.
Suite 103
478 Craighead Street
NASHVILLE, TN 37204
Tel: (615) 383-9136
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CM,E
Hewlett-Packard Co.
Suite C-110
4171 North Mesa
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Tel: (915) 533-3555
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HOUSTON, TX 77036
Tel: (713) 776-6400
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Hewlett-Packard Co.
3309 67th Street
Suite 24
LUBBOCK, TX 79413
Tel: (806) 799-4472
M
Hewlett-Packard Co.
P.O. Box 1270
930 E. Campbell Rd.
RICHARDSON, TX 75081
Tel: (214) 231-6101
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Hewlett-Packard Co.
205 Billy Mitchell Road
SAN ANTONIO, TX 78226
Tel: (512) 434-8241
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Utah

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SALT LAKE CITY, UT 84119
Tel: (801) 974-1700
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Virginia

Hewlett-Packard Co.
P.O. Box 9669
2914 Hungary Spring Road
RICHMOND, VA 23228
Tel: (804) 285-3431
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Hewlett-Packard Co.
P.O. Box 4786
3110 Peters Creek Road, N.W.
ROANOKE, VA 24015
Tel: (703) 563-2205
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Hewlett-Packard Co.
P.O. Box 12778
5700 Thurston Avenue
Suite 111
VIRGINIA BEACH, VA 23455
Tel: (804) 460-2471
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Washington
Hewlett-Packard Co.
15815 S.E. 37th Street
BELLEVUE, WA 98006
Tel: (206) 643-4000
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Hewlett-Packard Co.
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708 North Argonne Road
SPOKANE, WA 99206
Tel: (509) 922-7000
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West Virginia
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4604 MacCorkle Ave., S.E.
CHARLESTON, WV 25304
Tel: (304) 925-0492
A,CM,MS

Wisconsin
Hewlett-Packard Co.
150 S. Sunny Slope Road
BROOKFIELD, WI 53005
Tel: (414) 784-8800
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URUGUAY
Pablo Ferrando S.A.C. e.l.
Avenida Italia 2877
Casilla de Correo 370
MONTEVIDEO
Tel: 403102
Telex: 901 Public Booth Para Pablo
Ferrando 919520
Cable: RADIUM Montevideo
A,CM,E,M

Guillermo Kraft del Uruguay S.A.
Avda. Libertador Brig. Gral.
Lavalleja 2083
MONTEVIDEO
Tel: 234588, 234808, 208830
Telex: 6245 ACTOUR UY
P

U.S.S.R.
Hewlett-Packard Co.
Representative Office
Pokrovsky Blvd. 4/17 KV12
MOSCOW 101000 Tel: 294-2024
Telex: 7825 HEWPACK SU

VENEZUELA
Hewlett-Packard de Venezuela C.A.
Apartado 50933
3A Transversal Los Ruices Norte
Edificio Segre 2Y3
CARACAS 1071
Tel: 239-4133, 239-4777,
239-4244
Telex: 25146 HEWPACK
Cable: HEWPACK Caracas
A,CP,E,MS,P

YUGOSLAVIA
Iskra-Commerce-Representation of
Hewlett-Packard
Sava Centar Delegacija 30
Milentija Popovica 9
11170 BEOGRAD
Tel: 638-762
Telex: 12042, 12322 YU SAV CEN

Iskra-Commerce-Representation of
Hewlett-Packard
Koprsko 46
61000 LJUBLJANA
Tel: 321674, 315879
Telex:

ZAMBIA
R. J. Tilbury (Zambia) Ltd.
P.O. Box 2792
LUSAKA
Tel: 81243
A,E,M,P

ZIMBABWE
Field Technical Sales
45 Kelvin Road, North
P.B. 3458

SALISBURY
Tel:
C,E,M,P

FOR COUNTRIES AND AREAS NOT LISTED:

CANADA

Ontario
Hewlett-Packard (Canada) Ltd.
6877 Goreway Drive
MISSISAUGA, Ontario L4V 1M8
Tel: (416) 678-9430
Telex: 610-492-4246

EASTERN USA

Maryland
Hewlett-Packard Co.
4 Choke Cherry Road
Rockville, MD 20850
Tel: (301) 258-2000

MIDWESTERN USA

Illinois
Hewlett-Packard Co.
5201 Tolview Drive
ROLLING MEADOWS, IL 60008
Tel: (312) 255-9800

SOUTHERN USA

Georgia
Hewlett-Packard Co.
P.O. Box 105005
450 Interstate N. Parkway
ATLANTA, GA 30339
Tel: (404) 955-1500

WESTERN USA

California
Hewlett-Packard Co.
3939 Lankersim Blvd.
LOS ANGELES, CA 91604
Tel: (213) 877-1282

EUROPEAN AREAS NOT LISTED, CONTACT

SWITZERLAND
Hewlett-Packard S.A.
7 Rue du Bois-du-Lan
CH-1217 MEYRIN 2, Switzerland
Tel: (022) 83-81-11
Telex: 27835 hpse
Cable: HEWPACKSA Geneve

EAST EUROPEAN AREAS NOT LISTED, CONTACT

AUSTRIA
Hewlett-Packard Ges.m.b.h.
Wehlistrasse 29
P.O. Box 7
A-1205 VIENNA
Tel: (222) 35-16-210
Telex: 135823/135066

MEDITERRANEAN AND MIDDLE EAST AREAS NOT LISTED, CONTACT

GREECE
Hewlett-Packard S.A.
Mediterranean & Middle East
Operations
35, Kolokotroni Street
Platia Kefallariou
GR-Kifissia, **ATHENS**, Greece
Tel: 808-0359, 808-0429
Telex: 21-6588
Cable: HEWPACKSA Athens

INTERNATIONAL AREAS NOT LISTED, CONTACT

OTHER AREAS
Hewlett-Packard Co.
Intercontinental Headquarters
3495 Deer Creek Road
PALO ALTO, CA 94304
Tel: (415) 857-1501
Telex: 034-8300
Cable: HEWPACK



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Should one of your HP instruments need repair, the HP service organization is ready to serve you. However, you can help us serve you more effectively. When sending an instrument to HP for repair, please fill out this card and attach it to the product. Increased repair efficiency and reduced turn-around time should result.

COMPANY

ADDRESS

TECHNICAL CONTACT PERSON

PHONE NO. EXT.

MODEL NO. SERIAL NO.

MODEL NO. SERIAL NO.

P.O. NO. DATE

Accessories returned with unit

NONE CABLE(S)

POWER CABLE ADAPTER(S)

OTHER _____ over



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MODEL NO. SERIAL NO.

MODEL NO. SERIAL NO.

P.O. NO. DATE

Accessories returned with unit

NONE CABLE(S)

POWER CABLE ADAPTER(S)

OTHER _____ over

Service needed

CALIBRATION ONLY
 REPAIR REPAIR & CAL

OTHER _____

Observed symptoms/problems

FAILURE MODE IS:

CONSTANT INTERMITTENT

SENSITIVE TO:

COLD HEAT VIBRATION

FAILURE SYMPTOMS/SPECIAL
CONTROL SETTINGS _____

If unit is part of system list model
number(s) of other interconnected in-
struments. _____

Printed in U.S.A.

Service needed

CALIBRATION ONLY
 REPAIR REPAIR & CAL

OTHER _____

Observed symptoms/problems

FAILURE MODE IS:

CONSTANT INTERMITTENT

SENSITIVE TO:

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FAILURE SYMPTOMS/SPECIAL
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